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The new Kalendar. Jan.y 8.th 1759

To find the Golden Number, Cycle of the Sun, and Roman Indiction for any Year.

The Golden Number, or Prime, is a Revolution of 19 years; in which Space of Time the Sun and Moon finish all their Variety of Aspects.

The Cycle of the Sun is a Revolution of 28 years; being that Period of Time in which all the Variety of Dominicall Letters and Leap years do happen

The Roman Indiction consists of 15 years; and was formerly the Time in which the Romans taxed the Conquered Nations; but is long ago out of use in England.

Rule 3 when 1 9 3 to the year hath added been,

Divide by 19 28 & 15.

Anno 1759 I demand the Golden Number Cycle of the Sun and Roman Indiction

1759		
1		
19 | 1760 | 92	28 | 1764 | 63	15 | 1762 | 117
171	168	15
50	84	26
38	84	15
(12) Golden Number	(4) Cycle of the Sun	112
		105
		(7) Roman Indiction

Anno 1767 I demand as above

1767		
1		
19 | 1767 | 93	28 | 1764 | 63	15 | 1770 | 117
171	168	15
58	96	27
57	84	15
(1) Golden Number	(12) Cycle of the Sun	120
		115
		(5) Roman Indiction

To find the Epact for any year till the year 1900.
The Epact is the Difference between the Lunar and Solar year, and alters annually 11.

Rule { Divide the year by 19; multiply by 11;
Reject all thirties, and the Epact given.

Anno 1759 I demand the Epact

19 | 1759 | 92
171
49
38
11
11
30 | 121 | 4
120
(1) the Epact

Anno 1760 I demand the Epact

19 | 1760 | 92
171
50
38
12
11
30 | 132 | 4
120
(12) the Epact

Anno 1767 I demand the Epact

19 | 1767 | 92
171
57
38
19
11
30 | 209 | 6
180
(29) the Epact

Anno 1781 I demand the Epact

19 | 1781 | 93
171
71
57
14
11
30 | 154 | 5
150
(4) the Epact

MSS 285B
RB NMAH

To find if it is Leap year or Common year

Rule { Leap year is given when 4 will divide
The Centurles Compleat or oddyears beside

Is the year 1759 Leap year or Common year

4/59/14
4
19
16
(3) Common year

Is the year 1760 Leap year or Common year

4/60/15
4
20
20
∴ Leap year

Is the year 1800 Leap year or Common year

4/18/14
16
(2) Common year

Is the year 2000 Leap year or Common year

4/20/5
20
∴ Leap year

To find the Dominical or Sunday Letter for any year till the year 1800.

Rule { Divide the year; and fourth year, by by 7;
What's left Substract from 7, the Letters given.

In Leap year there are two Dominical Letters; the first of which serves from the beginning of the year to 29th of February; and the latter which this Rule finds from thence to the years End.

Anno 1759 I demand the Dominical Letter

4|1759|
439|
7|219|3|14
21
9
7
29
28
0
7
(7) G Dominical Letter

Anno 1760 I demand the Dominical Letter

4|1760
440
7|220|0|14
21
10
7
30
28
2
7
(5) F E Dominical Letter

Anno 1769 I demand the Dominical Letter

4|1769
442
7|221|1|315
21
11
7
41
35
6
7
(1) A Dominical Letter

To find what Day of the Week any day of the month falls on for ever

Rule § at Dover Dwells George Brown Esquire,
§ Good Christopher Finch and David Fryar.

What day of the Week does Janr. 9th. 1759 fall on

4/1759
439
7/2198/314
21
9
7
28
28
0
7
(7)

Sunday
A B C D E F G
1 2 3 4 5 6 7

7 Sunday
8 monday
9 Tuesday

What day of the Week does May 1th 1759 fall on

4/1759
439
7/2198/314
21
9
7
28
28
0
7
(7)

Sunday
A B C D E F G
1 2 3 4 5 6 7

answer Tuesday is the 1 may

What day of the Week will Sept. 29th. 1761 fall on

4/1761
440
7/2201/314
21
10
7
31
28
3
7
(4)

Sunday
A B C D E F G
1 2 3 4 5 6 7

Sunday is 6
Sunday is 13
Sunday is 20
Sunday is 27
monday is 28
Tuesday is 29 of Sept. 1761

What day of the Week will January 1, 1764 fall on

4/1764
441
7/2205/315
21
10
7
35
35
0
7
(7)

Sunday
A B C D E F G

And monday is the 1 Jan^{d} 1764

What day of the Week will march 25 1771 fall on

4/1771
442
7/2213/316
21
11
7
43
42
1
7
(6)

Sunday
A B C D E F G

1 Sunday is 3
Sunday is 10
Sunday is 17
Sunday is 24
monday is 25 day of march

What Day of the Week will August 1, 1789 fall on

4/1789
447
7/2236/319
21
15
7
66
63
3
7
(4)

Sunday
A B C D E F G

And Saturday is 1 day of August 1789

To find Easter Limits for any Year.

Easter Limits is the day of full Moon that happens upon, or first after the 21st day of march; on which day the Vernal Equinox fell at the Council of Nice.

Rule
- Add 6 to the Epact; reject 3 times 10;
- Whats left take from 50, the Limit you gain:
- Which if 50 one else you must make it and even;
- When 49 too, if Primes more than 11.

Anno 1761 I demand Easter Limits

19|1761|92
171
51
38
13
11
30|143|4
120
23
6
29|
Answer march 50
21

Anno 1762 I demand Easter Limits

19|1762|92
171
52
38
14
11
30|154|5
150
4
6
10
50
40
Ans[d] April 31
9

Anno 1767 I demand Easter Limits

19|1767|92
171
57
38
19
11
30|209|6
180
29
6
30|35|1
30
5
50
45
Ans[r] April 31
14

To find Easter Day for any Year.

Easter Day is always the first Sunday after Easter Limits; and cannot happen before the 22. March, nor after the 25th of April.

Rule { The Letter more by 4 from Limits take;
What's left from nearest 7's will Easter make.

When does Easter Sunday fall Anno 1759

4/1759
439
7/2198/314
21
9
1
28
28
0
7
7
4
(11)

19/1759/92
171
49
38
11
11
30/121/4
120
1 Epact
6
7
50
43 Easter Limits
11
32
35
3
43
46
31
(15) is Easter Sunday

Ans[d] April

When does Easter Sunday fall Anno 1761

4/1761
440
7/2201/3914
21
10
7
31
28
3
7
4
4
(8)

19/1761/92
171
51
38
13
11
30/143/4
120
26 Epact
6
29
50
21 Easter Limits
8
13
14
1
21
22

Ans March

When does Easter Sunday fall anno 1763

4/1763
448
7|2205|315
21
10
7
33
28
5
7
2
4
(6)

19/1763/92
171
53
38
15
11
30|1651|5
150
15
6
23
28
5
29
34
31
3

Ans April

When does Easter Sunday fall anno 1769

4/1769
442
7|2211|315
21
11
7
41
35
6
7
1
4
(5)

19/1769/93
171
59
57
2
11
22
6
28
50
22
17
21
4
22
26

Ans March

When does Easter Sunday fall anno 1784

4/1784
446
7|2230|318
21
15
7
60
56
4
7
3
4
(7)

19/1784/93
171
74
57
17
11
30|1877|6
180
7 Epact
6
13
50 Easter Limits
37
7
30
35
5
37
42
31
(11)

To find the Moons age

Rule Add the Epact Day of the month and number of Months together counting January 0 February 2 march 3 April 2 May 3 June 4 July 5 August 6 September 8 October 8 November 10 and December 10

Jan.r 12.th 1759 I demand the Moon's age

19|1759|92
171

49
38

11
11

30|121|4
120

1 Epact
12 Day of the month
0 Number of months

13 moon age

Dec.r 25.th 1760 I demand the Moon's age

19|1760|92
171

50
38

12
11

30|132|4
120

12 Epact
5 Day of the month
0 Number of months

17
30

17 Moons age

July 18.th 1763 I demand the Moon's age

19|1763|
171

53
38

15
11

30|165|
150

15 Epact
18 Day of the month
3 Number of the months

38
30

8 Moons age

What day of February 1759 will the Moon Change

19|1759|9
171

49
38

11
11

30|121|4
120

1
2

3

Ans^t February 30
27

What day of May 1761 will the Moon Change

19|1761|92
171

51
36

13
11

30|143|4
120

23
3

26
30

4

Ans^d may

What day of Novr 1767 will the Moon Change

19|1767|92
171

57
38

19
11

30|209|6
186

29
8

37
60

23

Answer Nov^r

What day of March 1759 will it be full Moon

19|1759|92
171

49
38

11
11
30|121|4
120

1

2
15

Ans^d March 3

What day of October 1764 will it be full Moon

19|1764|92
171

54
38

16
11
30|176|5
150

26
8

34
45

Ans^d October 11

How old will the Moon be Decr. 31st. 1799

19|1799|94
171

89
76

13
11
30|143|4
120

23
31

10

64
60
---
4 days old

To find the Time of the moons Southing or coming upon the meridian.
Rule Multiply the moons Age by 4 and divide the Product by 5.

When will the Moon come South Jan.r 15.th 1759

19 | 1799 | 92
171

49
38
11
11
30 | 121 | 4
120
1
15
8
16
4
5 | 64 | 12h 48
5
14
10
4
12
48

Ans.r 48 past 12 at Night

May 20.th 1759 when will the Moon come South

19 | 1759 | 92
171

49
38
11
11
30 | 121 | 4
120
1
20
3
24
4
5 | 96 | 19 | 12
5 | 24
7h 12
46
45
1
12
12

0 Hrs.s 12.m past 1 in the morning

To find the Time of Highwater in any known Port or Harbour of the World

Rule To the Moons Southing add a certain Number of Hours taken out of the Mariner's Kalender or the following Tide Table; and their Sum is the Time of Highwater in the Port required.

A Table of the Sea Coasts.

	H	M
Portsmouth, Queenborough, Southhampton	0	00
Rochester, Winchelsea, Flushing	0	45
Downs, Gravesend, Ramkins, Guernsey	1	30
Denbigh, Bell Isle, Holy Isle, Downs Road	2	15
London, Tinmouth, Hartlepool	3	00
Whitby, Scarbrough, Berwick, Flushing, Staples	3	45
Flambrough, Humber, Bridlington Bay	4	30
Plymouth, Ramsay, Newcastle, Severn	5	15
Lynn, Hosdyke, Hull, Weymouth, Dartmouth	6	00
Boston, Startpoint, Foulness, Bristol Key	6	45
Bridgwater, Milford haven, Lizard, Winterton	7	30
Yarmouth, Isle of Wight, the Nudes	8	15
Isle of Man, Whitehaven, Orkneys, Poole, South Foreland	9	10
Dover, Harwich, Orfordness, Bullin	10	10
Rye, Solebay, Margate Road, Liverpool	11	15

When will it be High Water at Whitby Jan.r 20.th 1759

19|1759|92
171
49
38
11
11
30|121|4
120
1
20
0
21
4
5|84|16|4|48
5 | 3|1|45
34 | 20|33
30 | 12
4 | 8|33
12
48

Ans.r 33 m past 8 Clock

When will it be High Water at Whitby Sept.r 29.th 1764

19|1764|92
171
54
38
16
11
1|76|5
150
26
29
8
63
60
3
4
5|12|2|1|24
10|3|1|45
2|12|6|4|09
24

Ans.r 9 past 6 Clock

When will it be Highwater at London June 11.th 1763

19|1763|92
171
53
38
15
11
30|165|5
150
15
11
4
30
30

Ans.r Highwater at 3 Clock

When will it be Highwater

When will it be High water at Dublin June 20.th 1765

19 | 17 65 | 92
171
55
38
17
11
30 | 187 | 6
180
7
20
4
31
30
1
4
4
12
48

00 48
08 15
9 03

Ans 3 past 9 Clock

When will it be High water at Lisbon Novr. 11.th 1773

19 | 1773 |
171
63
57
6
11
30 | 66 | 2
60
6
11
10
27
4
5 | 108 | 21 36
10 | 02 15
8 | 23 51
5 | 12
3 | 11 51
12
36

Ans 51 past 11 Clock

Plain Trigonometry. 1759

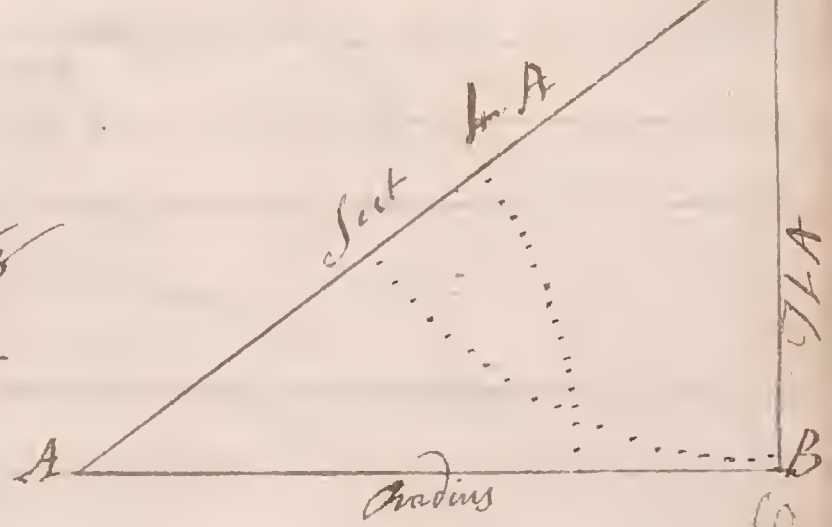
In all right angled plain Triangles, if one of the Leggs be made the Radius of a Circle, then shall the other Legg become the Tangent of its opposite angle, and the Hypothenuse the Secant of the same angle. But if the Hypothenuse be made Radius, then shall each Legg become the Sine of its opposite angle.

In all plain Triangles, the Sides are to each other as the Sines of their opposite Angles.

In all plain Triangles; as the Sum of any two Sides, Is to their Difference; So is the Tangent of half the Sum of their opposite Angles, to the Tangent of half the Difference of these Angles.

In all plain Triangles as the Base, Is to the Sum of the other two Sides; So is their Difference, to the alternate Base, or Difference of the Segments of the Base.

Case 1 given } Base AB = 56 Miles, angle at A = 36° 20 } To find the Hypt. BC and Hypot AC making all Sides Radius



Base A B made Radius

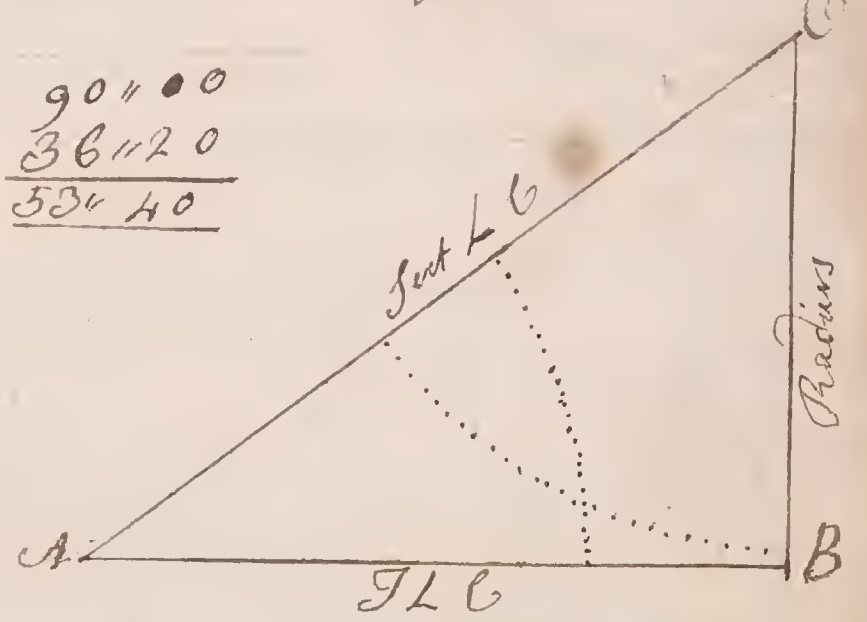
a Radius	90 00	10
To the Log of the Base	56	1748188
To is Tangent L A	36 20	9866564
To the Log of the Perpendicular	42	1614742

as Radius — 90,00 — 10
To the Log of the Base — 56 — 1748188
To is Sine L A — 36 20 — 9866564
To the Log of the Hypothenuse 69.51 — 1842077

Perpendicular B C made Radius

as Tangent L C	53 40	10.133436
To the Log of the Base	56	1.748188
To is Radius	90 00	10
To the Log of the perpendicular	42	1614752

90 00
36 20
53 40



as Tangent L C	53 40	10.133436
To the Log of the Base	56	1.748188
To is Secant L C	53 40	10.227325
To the Log of the Hypothenuse	69:51	11.975513
		1.842077

as Sine L C	53 40	9.906111
To to the Log of the Base	56	1.748188
To is Sine L A	53 40	9.772675
To the Log of the perpendicular 42		11.520863
		1.614752

Hypothenuse A C made Radius

as Sine L C	53 40	9.906111
To the Log of the Base	56	1.748188
To is Radius	90,00	10
To the Log of the Hypothenuse	69:51	11.748299
		1.842077

Case 2 } Hyp.t BC = 57 Miles } To find the Base AB & Hypot
Given } Angle at A = 34° 20' } & making all Sides Radius

Perpendicular BC made Radius

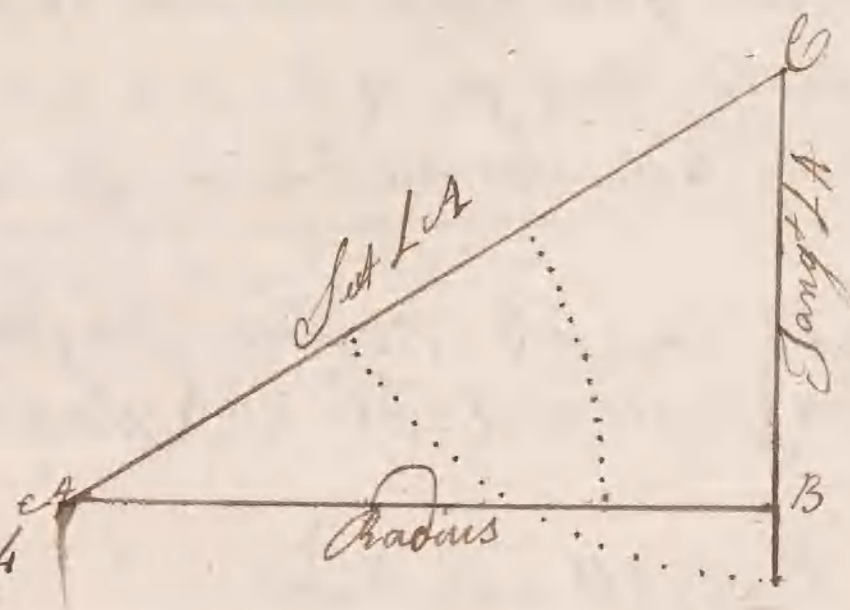
as Radius	90° 00	10
Is to the Log of the perpend.	57	1755875
So is Tangent ∠C	55° 40	10.165575
To the Log of the Base	83.46	1921450

as Radius	90° 00	10
Is to the Log of the perpendicular	57	1755875
So is Secant ∠C	55° 40	10.247716
To the Log of the Hypothenuse	101	2.003591

Base AB made Radius

as Tangent ∠A	34° 20	9834425
Is to the Log of the perpendicular	57	1755875
So is Radius	90° 00	10
To the Log of the Base	83.46	1921450

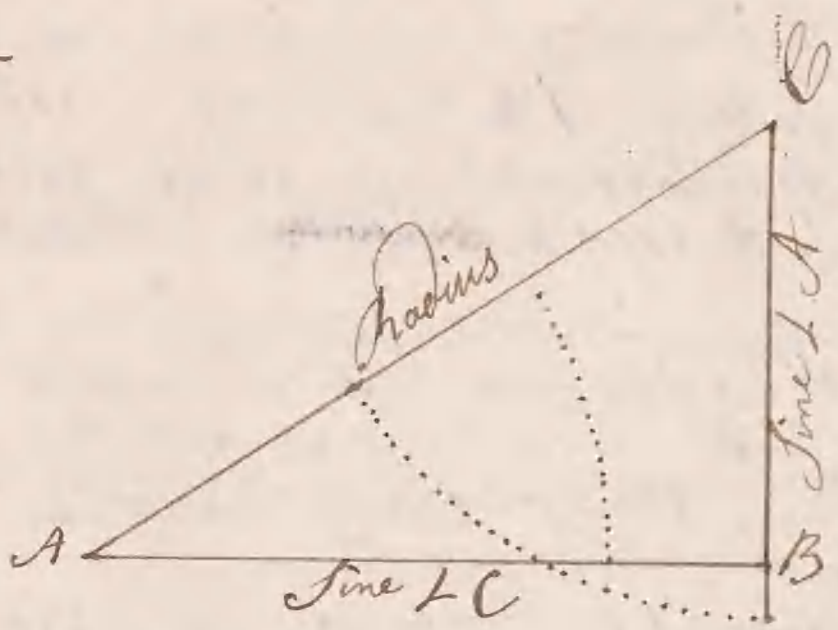
as Tangent ∠A	34° 20	9834425
Is to the Log of the perpendicular	57	1755875
So is Secant ∠A	34° 20	10.083141
To the Log of the Hypothenuse	101	11839016
		2.003591



Hypothenuse AC made Radius

as Sine ∠A	34° 20	9751284
Is to the Log of the perpendicular	57	1755875
So is Sine ∠C	55° 40	2.916859
To the Log of the Base	83.46	11672734
		1921450

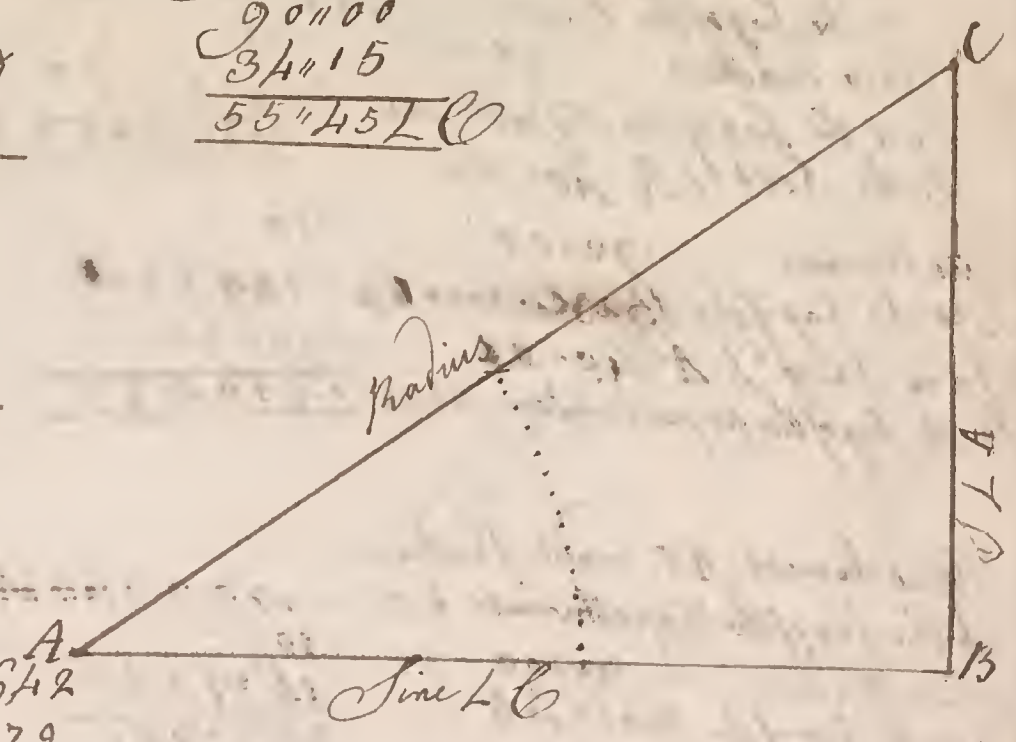
as Sine ∠A	34° 20	9751284
To the Log of the perpendicular	57	1755875
So is Radius	90° 00	10
To the Log the Hypothenuse	101	2003591



Case 8 { Hypot AC = 84 Miles } { To find the Base AB & Opp. BC
Given { Angle at A = 34° 15 } { making all Sides Radius

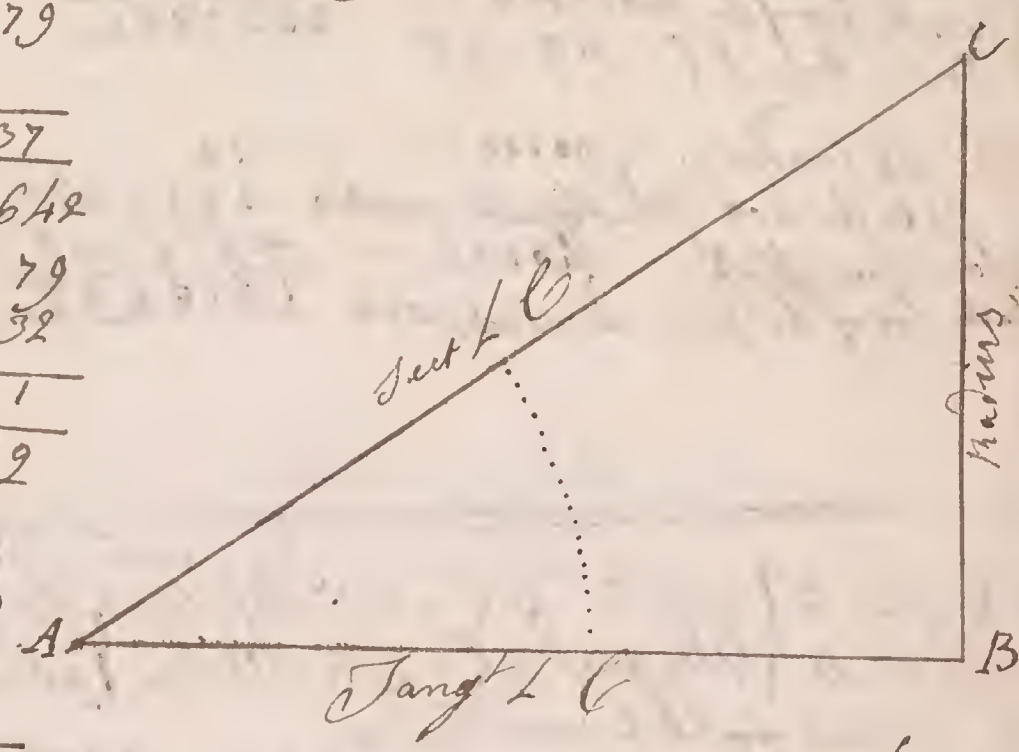
Hypothenuse AC made Radius
as Radius 90,00 10
Is to the Log of the Hypothenuse 84 .. 1.924279
So is Side L C ..... 55.45 ..... 9.917290
To the Log of the Base 69.43 1.841569

as Radius 90.00 10
Is to the Log of the Hypothenuse 84 .. 1.924279
So is Sine L A ..... 55.45 ..... 9.750385
To the Log of the perpendicular 47.38 1.674637



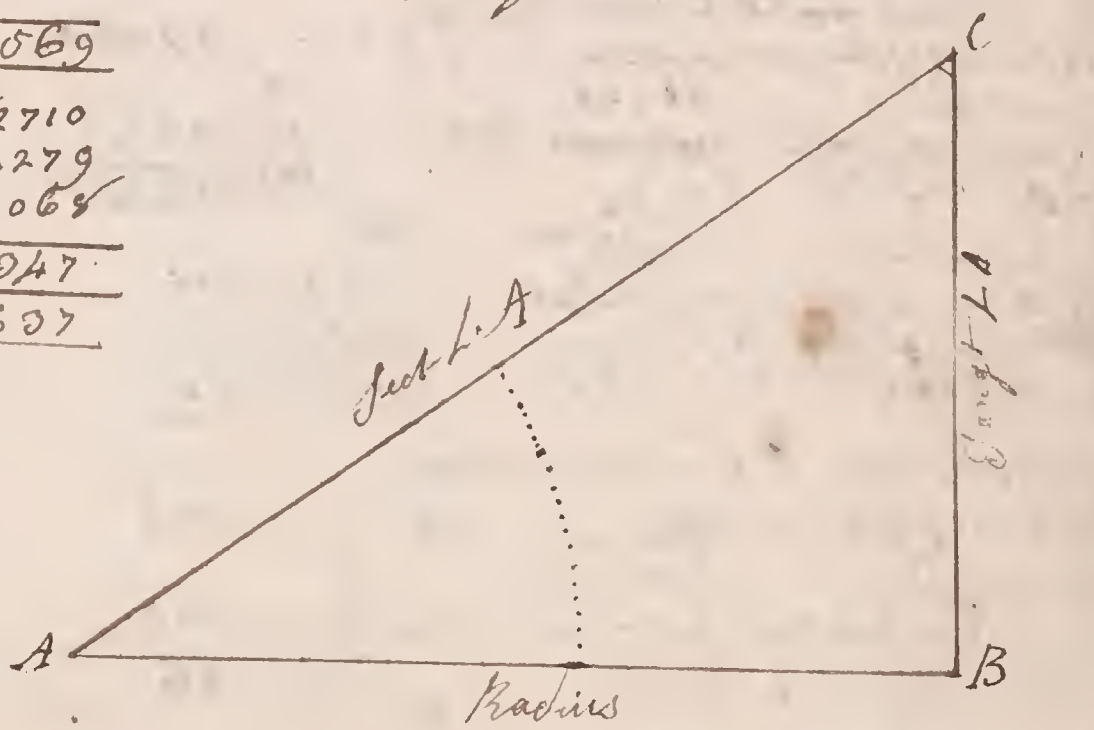
Perpendicular BC made Radius
as Sect L C ..... 55.45 ..... 10.249642
Is to the Log of the Hypothenuse 84 .. 1.924279
So is Radius 90.00 10
To the Log of the perpendicular 47.38 1.674637

as Sect L C ..... 55.45 ..... 10.249642
Is to the Log of the Hypothenuse 84 .. 1.924279
So is Tang L C ..... 55.45 ..... 10.166932
To the Log of the Base 69.43 12.091211
1.841569



Base AB made Radius
as Sect L A ... 34.15 ..... 10.082710
Is to the Log of the Hypothenuse 84 .. 1.924279
So is Radius 90.00 10
To the Log of the Base 69.43 1.841569

as Sect L A ..... 34.15 ..... 10.082710
Is to the Log of the Hypothenuse 84 .. 1.924279
So is Tang L A ... 34.15 ..... 9.883068
To the Log of the perpendicular 47.38 11.757947
1.674637



Case A } Base AB = 48 Miles } To find the Opp.r BC & angles
Given } Hypot AC = 63 Miles } at A & C making each Given

Base AB made Radius
as the Log of the Base ..... 48 .. 1.681241
Is to Radius ... 90.00 10
So is the Log of the Hypothenuse 63 1.799340
To the Sect ∠A 40.22 1011 8099

as Radius 90.00 10
Is to the Log of the Base ..... 48 .. 1.681241
So is Tang.t ∠A 40.22 ..... 9.929452
To the Log of the perpendicular 40.80 1.610693

Hypothenuse AC made Radius
as the Log of the Hypothenuse 63 ..... 1.799340
Is to Radius 90.00 10
So is the Log of the Base 48 ..... 1.681240
To the Sine ∠C 49.38 2.881900

as Radius 90.00 10
Is to the Log of the Hypothenuse 63 ... 1.799340
So is Sine ∠A ..... 40.22 ..... 9.811358
To the Log of the perpendicular 40.80 1.610698

Side Radius
Sect ∠A
Tang.t ∠C
A
B
Radius
C
Radius
Sine ∠A
A
B

Case 5 } Opp.r BC = 25 Miles } To find the Base AB & Angles
given } Hypot AC = 38 Miles } at A & C making each given

Perpendicular BC made Radius
as the Log of the perpendicular ..... 25 ... 1.397940
Is to Radius 90.00 10
So is the Log of the Hypothenuse 38 ..... 1.579784
To the Sect ∠C 48.52 1018184

as Radius 90.00 10
Is to the Log of the perpendicular 25 .... 1.397940
So is Tang.t ∠C 48.52 ..... 10.068796
To the Log of the Base 28.62 1.456736

Hypothenuse AC made Radius
as the Log of the Hypothenuse ... 38 ... 1.579784
Is to Radius 90.00 10
So is the Log of the perpendicular 25 1.397940
To the Sine ∠A 41.18 2818156

as Radius 90.00 10
Is to the Log of the Hypothenuse 38 ... 1.579740
So is Sine ∠C ..... 48.52 ..... 9.876899
To the Log of the Base 28.62 1.456683

Side Radius
Sect ∠C
Radius
A
B
Tang.t ∠C
C
Radius
Sine ∠A
A
B
Sine ∠C

Case 6 } Base AB = 8 Miles } To find the Hypothl & Angles at A
given } Perpr BC = 6 Miles } & making each given Side Radius

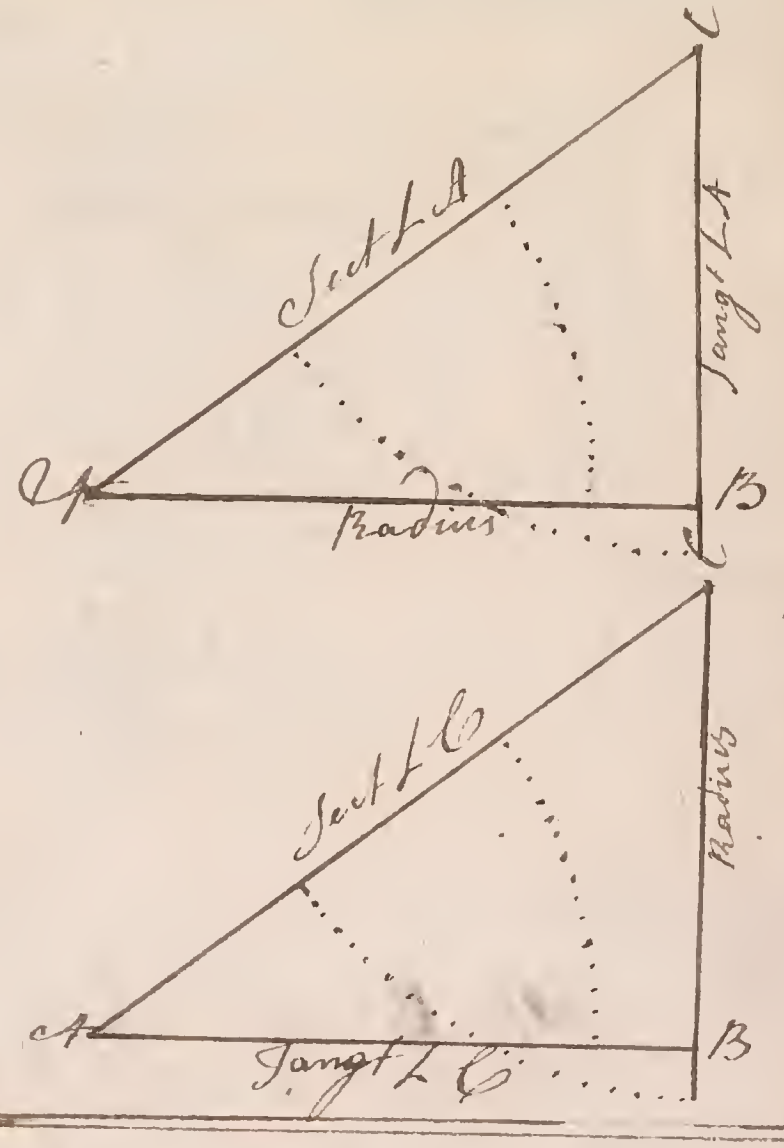
Base AB made Radius
as the Log of the Base 8 0903090
Is to Radius ..... 90°00 10
So is the Log of the perpr 6 0778151
To the Log of the Tangt ∠A 36°52 9875061

as Radius ..... 90°00 10
Is to the Log of the Base 8 0903090
So is Sect ∠A ..... 36°52 10096892
To the Log of the Hypoth 10 0999982

Perpendicular BC made Radius
as Log perpend 6 0778151
Is to Radius ..... 90°00 10
So is Log Base 8 0903090
To the Tangt ∠C 53°8 1012959

as Radius ..... 90°00 10
Is to the Log perpend 6 0778151
So is Sect ∠C ..... 53°8 10221781
To the Log of the Hypoth 10 ..... 1.000000

∠C 90°00
∠A 36°52
∠C 53°8



Oblique angled plain Trigonometry

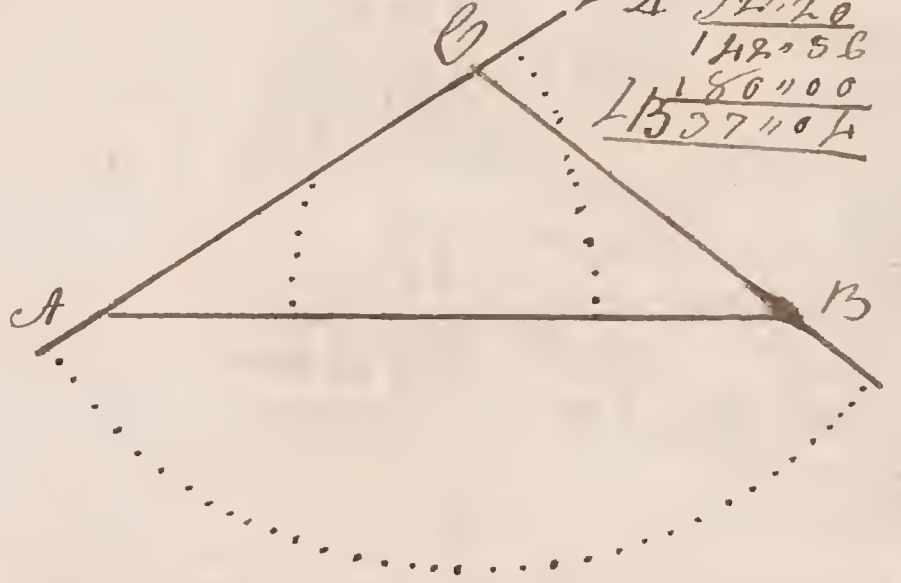
Case 1 Given } Two Sides and an angle opposite to one of them

Viz } Base AB = 56 Miles
Side BC = 32 Miles
Angle at A = 32° 20' } To find the rest

as Side BC ... 32 ... 1505150
is to Sine ∠A ... 32°20' ... 9728277
So is Base AB ... 56 ... 1748188
To Sine ∠C 69°24 ... 11476465
2971510

as Sine ∠A ... 32°20' ... 9728277
Is to Side BC ... 32 ... 1505150
So is Sine ∠B ... 37 ... 2780193
11285427
To Side AB 56.9 ... 1567006

180°00
69°24
∠C 101°36
∠A 32°20
142°56
180°00
∠B 37°04

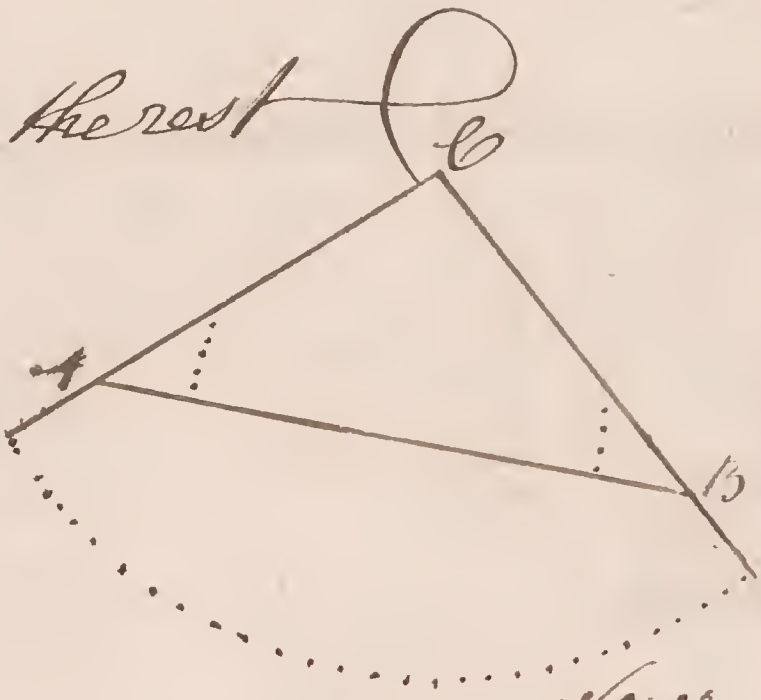


Do. Given } Base AB = 48 Miles
Side BC = 32 Miles
Angle at C = 98° 15' } To find the rest

as Base AB ... 48 ... 1681241
Is to Sine ∠C ... 81°45 ... 9995482
So Side BC ... 32 ... 1505156
11500638
To Sine ∠A 41°16 ... 9819391

as Sine ∠C ... 81°45 ... 9995482
Is to Base AB ... 48 ... 1681241
So is Sine ∠B ... 40°29 ... 9812597
11493838
To Side ∠C 31.5 ... 1498356

180°00
98°15
∠C 81°45
∠A 41°16
98°15
139°31
180°00
∠B 40°29



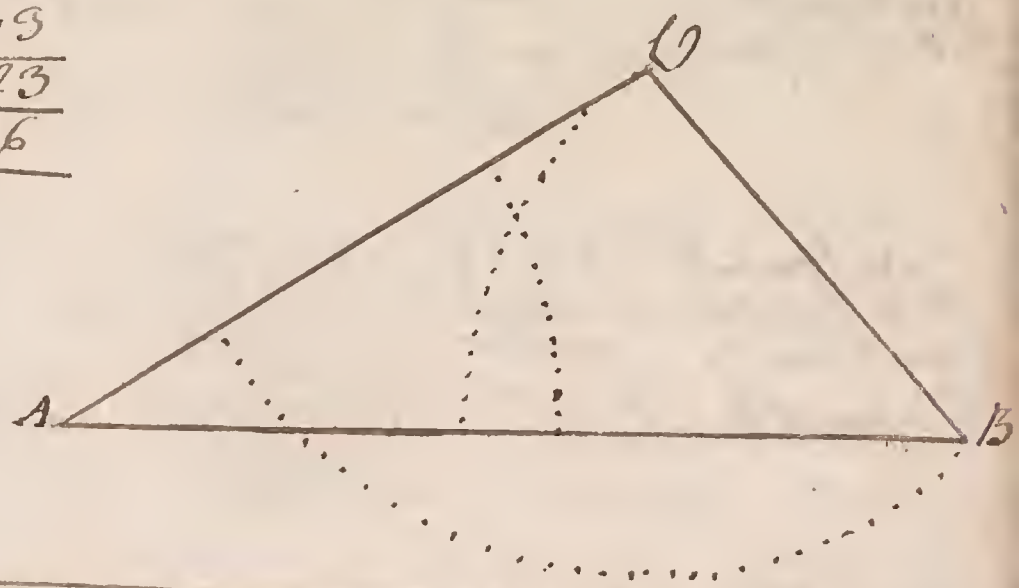
Case 2 Given } Two angles & a Side opposite to one of them

Viz^t } angle A = 31°20′
angle B = 46°15
Side BC = 64 Miles } To find the rest

31°20
46°15
77°35
∠C 180°00
102°25

as Sine ∠A ..... 31°20 .... 9.716017
So to Side BC ..... 64 ..... 1.806180
So Sine ∠B ..... 46°15 .... 9.857543
11.663723
So Side AC 458.75 2.747706

as Sine ∠A ..... 31°20 .... 9.716017
So to Side BC ..... 64 ..... 1.806180
So is Sine ∠C ..... 77°35 .... 9.989721
11.795901
So the Base AB 119.9 2.079884



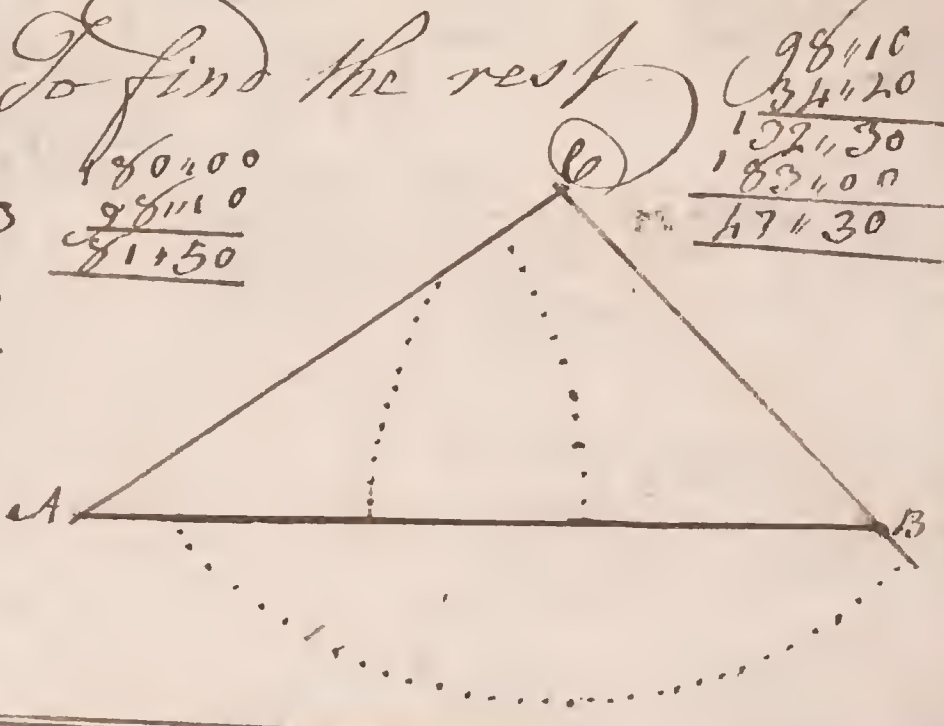
Do } Given } angle A = 34°20′
angle C = 98°10
Base AB = 32 Miles } To find the rest

180°00
98°10
81°50

as Sine ∠C .... 81°50 .... 9.995573
So to Base AB ... 32 ..... 1.505150
So Sine ∠A .... 34°20 .... 9.728227
11.233377
So Side BC 172.9 2.237804

as Sine ∠C .... 81°50 .... 9.995573
So to Base AB ... 32 ..... 1.505150
So Sine ∠B .... 47°30 .... 9.867631
11.372781
So Side AC 238.3 2.377208

98°10
34°20
132°30
180°00
47°30



Case 3 Given } Two Sides & their contained angle

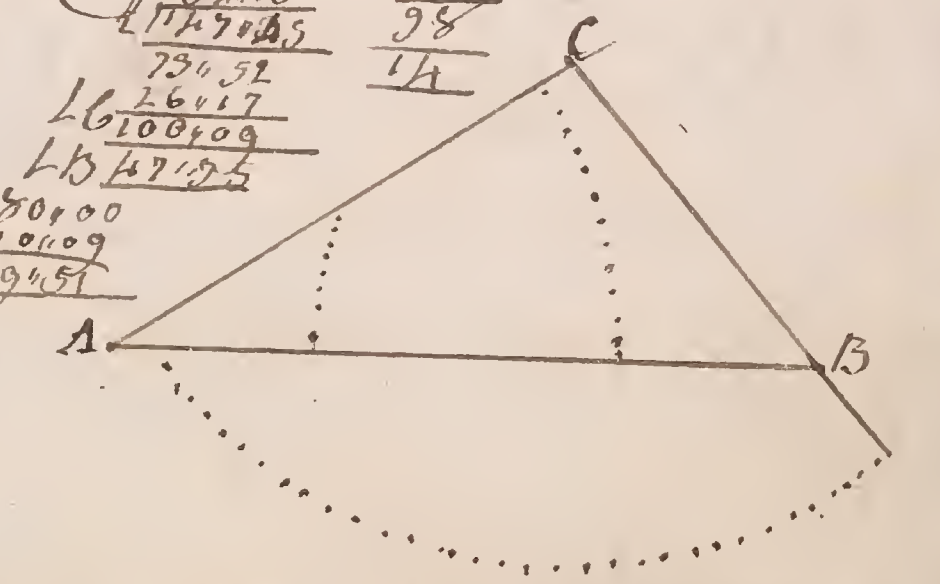
Viz^t } Base AB = 56 Miles
Side AC = 42 Miles
angle at C = 32°15 } To find the rest

as the Sum 2 Sides ... 98 — 1.991226
So to the Ex ..... 14 ..... 1.146128
So is Tang ½ Sum ... 73°52 .. 10.533703
So the Tang ½ the Ex of Sides 26°17 11.679831
2.669605

as Sine ∠C ... 79°51 ... 9.993149
So to Base AB ... 56 ..... 1.748188
So is Sine ∠A .... 32°15 .. 9.727238
11.475426
So Side BC 298.6 2.482267

180°00
32°15
147°45
73°52
∠C 26°17
100°09
∠B 47°35
180°00
100°09
79°51

56
42
98
14



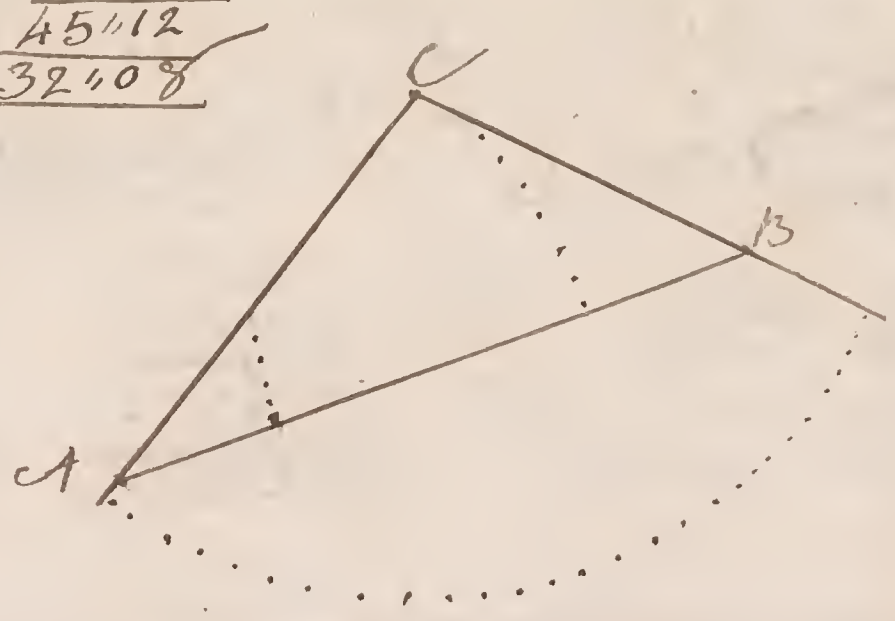
Do. given { Side AC = 64 Miles; Side BC = 48 Miles; Angle at C = 102° 40' } To find the rest

180°,00
102°40
77°20

as the Sum 2 Sides ... 112 ... 2049217
Is to the Diff ... 16 ... 1204120
So is Tang ½ Sum ... 38°40 ... 9903197
To the Tang of the Diff ½ 16°32 ... 11.107317
... 9.058099

A 64
B 48
16
LB 6.32
45°12
LA 32°08

as Sine LA ... 32°08 ... 9725823
Is to Side BC ... 48 ... 1681241
So is Sine C ... 77°20 ... 9989299
To Base AB 84°05 ... 11.670541
... 1944717



Case A given { The 3 Sides: Base AB = 72 Miles; Side AC = 64 Miles; Side BC = 36 Miles } To find the rest

as Base AB ... 72 ... 1.857332
Is to Sum of the other 2 Sides ... 100 ... 2.000000
So is their Diff ... 28 ... 1.447158
To the Segments of the Base 38.89 ... 1.589826

AC 64
BC 36
100
28

72°00
38°89
2 | 110°89
55°44

as Side AC ... 64 ... 1.806180
Is to Radius ... 90°00 ... 10
So is Sine AB ... 55°44 ... 1.744604
To Sine LACBD 60°13 ... 9.938424

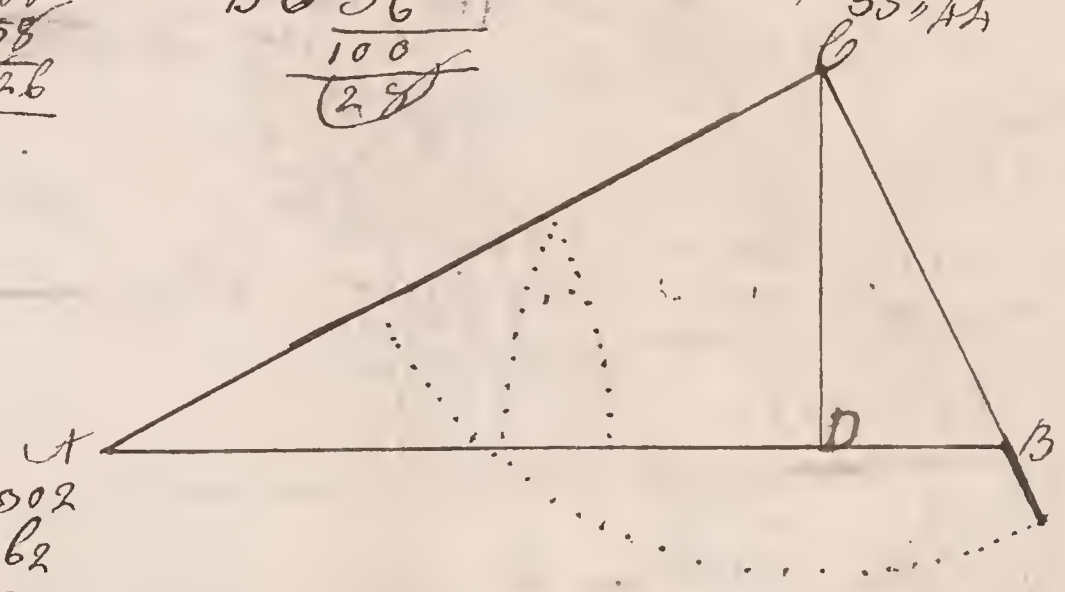
as Side BC ... 36 ... 1.556302
Is to Radius ... 90°00 ... 10
So is Side DB ... 16.56 ... 1.219062
To Side LDCB 27°23 ... 9.662760

72°00
38°89
½ | 110°89
Segments 55°44 AD
Segments 16°56 BD

90°00
60°13
LA 29°47

90°00
27°23
LB 62°37

LACD
LDCB 60°13
27°23
LACB 87°36



Plain Sailing. Jan: 30th 1759

The helps necessary to conduct a marriner thro the ocean in a long Voyage are, a Compass, a Log and a Sea Quadrant: By the Compass he is to observe what Course the Ship Steers; By the Log Line to give of the Ships way; and by the Quadrant to correct his Reckoning when he finds his Latitude by account faulty.

The Poles of the World are two imaginary Points, one which our Earth is Supposed perpetually to revolve; In the middle way between which lies the Equinoctial whence all Latitude is counted; those places on the North Side there of being said to be in North Latitude, and those on the South Side in South Latitude

Difference of Latitude is the Number of Miles a place lies to the Northward or Southward of any other place

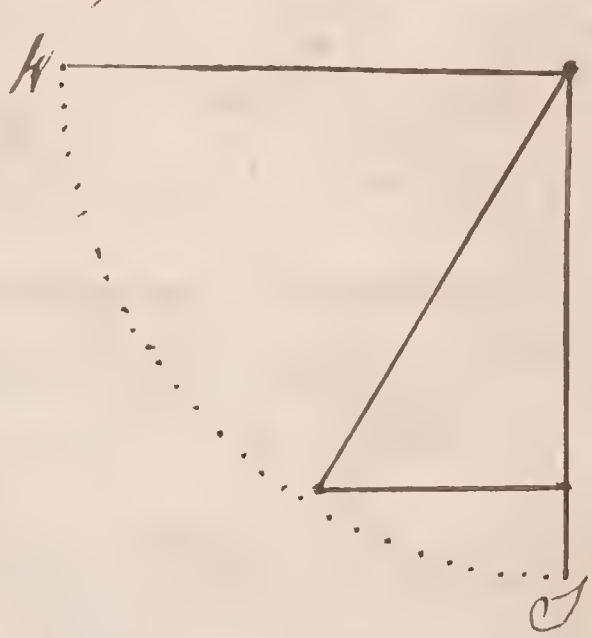
Departure is the Number of miles a Ship Sails directly East or West.

Course is that point of the Compass a Ship Sails on.

Distance is the Number of miles a Ship runs on any point of the Compass.

A Ship sails SWbS 96 Miles I demand her difference of Latitude and Departure

SWbS
90,00
33,45
56,15



as Radius ..... 90,00 ---- 10
Is to the Distance --- 96 ---- 1982271
So is Sine C Course --- 56,15 --- 1919846
To the x of Latt 79.82 — 1902117

as Radius ..... 90,00 ---- 10
Is to the Distance --- 96 ---- 1982271
So is S Course --- 33,45 ---- 1744739
To the Departure 53.34 — 1727010

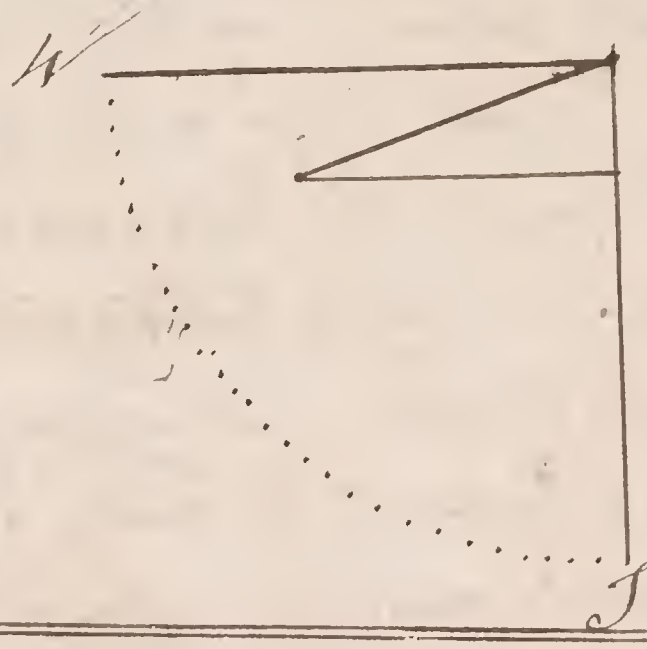
Ans^r her x of Latt is 79.82 miles Departure is 53.34 miles

A Ship from Brest Sails WSW 1/4 W 264 Miles I demand her Differences of Latitude and Departure

As Radius ---- 90,00 --- 10
So to the Distance --- 264 --- 2.421604
So as S C Course ---- 19,41 --- 9.527400
So the ex of Lat.de 88.92 --- 1.949004

90,00
70,19
19,41

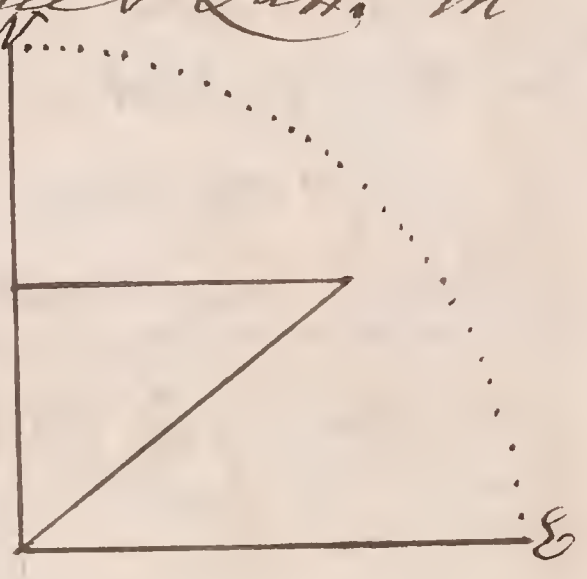
S C 60/88/1 Brest Lat.de 48,23 N
60 x of Lat.de 01,28,8
28 Lat.de in 46,55 N



A Ship from Whitby Sails N E 1/2 E till her Departure be 267 Miles I demand her Distance & Lat.de in

As Sine Course ---- 50,37 --- 9.884133
So to the Departure --- 267 --- 2.426511
So as Radius ---- 90,00 --- 10
So to the Distance 345.4 --- 2.538378

90,00
50,37
39,23 S E



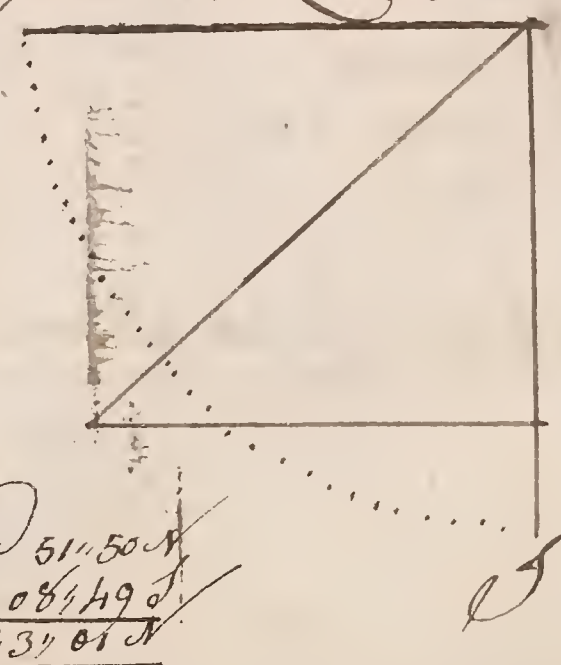
As S Course ---- 50,37 --- 9.884133
So to the Departure --- 267 --- 2.426511
So as S E C Course --- 39,23 --- 9.802435
So the ex of Lat.de 219.2 --- 1.2.228946
--- 2.340813

60/219/3,39
180
39

Whitby Lat.de 54,29 N
x of Lat.de 03,39 N
Lat.de in 58,08 N

A Ship from Kinsale Sails SW 1/4 W till her Departure be 584 Miles I demand her Distance & Lat.de in

As S Course ---- 47,49 --- 9.869818
So to the Departure --- 584 --- 2.766413
So as Radius ---- 90,00 --- 10
So to the Distance 788.1 --- 2.896595



As S Course ---- 47,49 --- 9.869818
So to the Departure --- 584 --- 2.766413
So as S E C Course --- 42,11 --- 9.827049
So the ex of Lat.de 529.1 --- 12.59 3462
--- 2.725644

90,00
47,49
42,11 S E

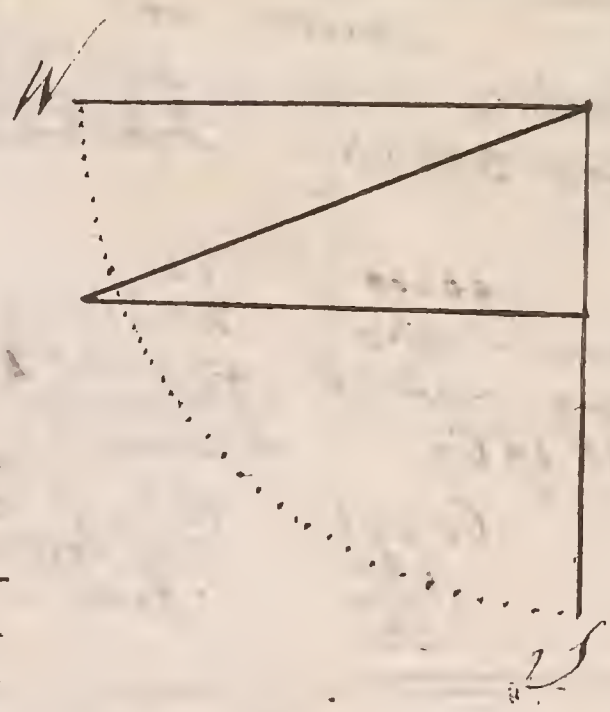
60/529/1
480
49

Kingsale Lat.de 51,50 N
x of Lat.de 08,49 S
Lat.de in 43,01 N

A Ship from Cape Finisterre Sails WSW till she arrive in Latt. 30°25 North I demand her Departure and Distance

Cape Finist. Latt 43°12 N
Latt in 30°25 N
12°47
60
767

90°00
67°30
SC 22°30



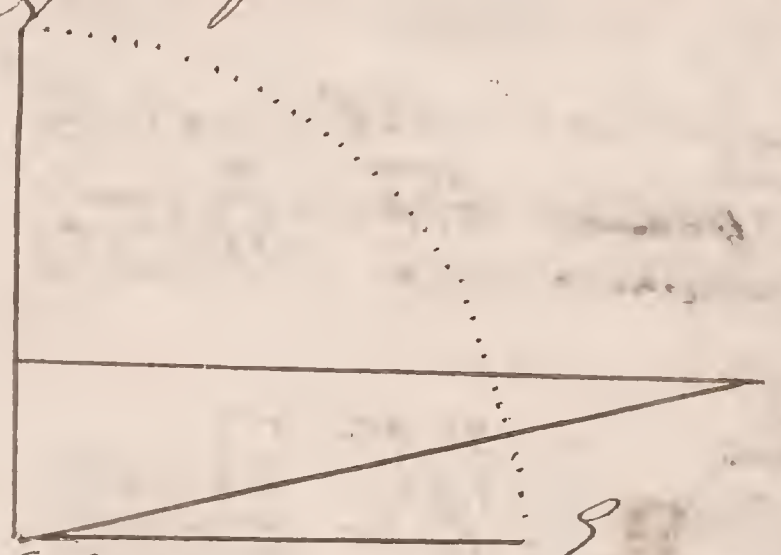
as SC Course ---- 22°30 ---- 9.582840
Is to the x of Latt ---- 767 ---- 2.884795
To R Radius ---- 90°00 ---- 10
3.301955
To the Distance 2004

as SC Course ---- 22°30 ---- 9.582840
Is to the x of Latt ---- 767 ---- 2.884795
To W Course ---- 67°30 ---- 9.965615
12.956410
3.267570
To the Departure 1852

A Ship from Cape Cod Sails 2 NE 3/4 E till she arrive in Latt. 48°10 North I demi. her Departure & Distance

90°00
FC 75°56
14°04

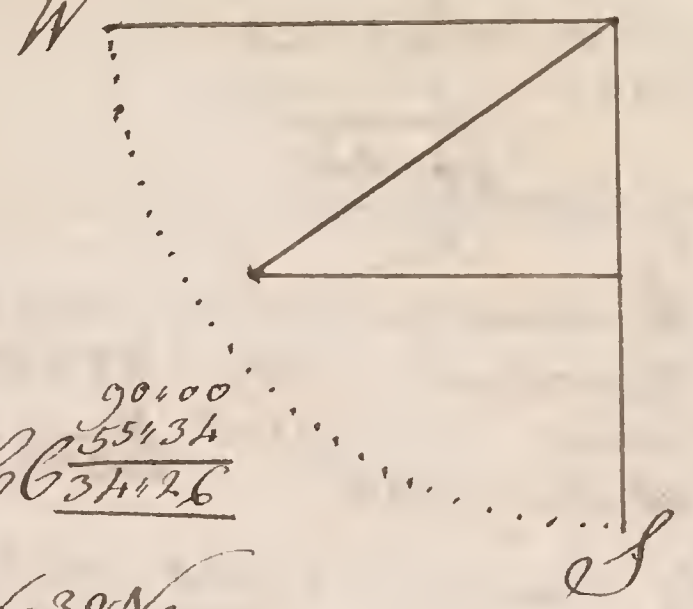
Cape Cod Latt 42°12 N
Latte in 48°10 N
5°58
60
358



as SC Course ---- 14°04 ---- 9.385697
Is to the x of Latt ---- 358 ---- 2.553883
To R Radius ---- 90°00 ---- 10
3.168186
To the Distance 1473

as SC Course ---- 14°04 ---- 9.385697
Is to the x of Latt ---- 358 ---- 2.553883
To E Course ---- 75°56 ---- 9.986778
12.540661
3.154964
To the Departure 1429

A Ship from Ushant Sails 348 Miles between the South and the west when her Departure is 287 Miles I demand her Course & Latt. in



as the Distance ------ 348 ---- 2.541579
Is to Radius ------ 90.00 ---- 10
So is the Departure --- 287 ---- 2.457882
So the S Course 55.34 ---- 9.916303

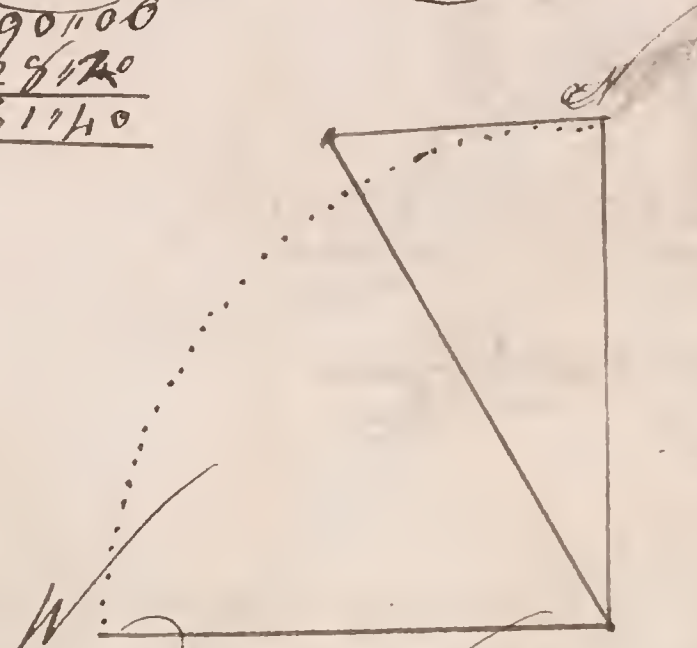
as Radius ------ 90.00 ---- 10
Is to the Distance --- 348 ---- 2.541579
So is Sine Course --- 34.26 --- 9.752992
So the x of Latt'd 196.7 ---- 2.293971

60 | 196 | 180 | 16

90.00
55.34
S 66 34.26

Ushant Latt'd 48.30 N
x of Latt'd 03.14 S
Latt'd in 45.16 N

A Ship from the Island of Madeira Sails 746 Miles between the North & the West when her Departure is 354 Miles I demand her Course & Latt. in



90.00
W 28.20
61.40

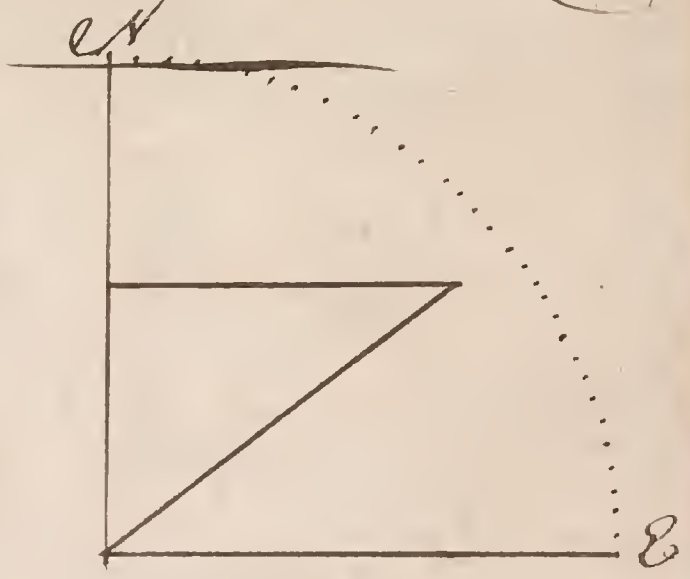
as the Distance ----- 746 ---- 2.872739
Is to Radius ------ 90.00 ---- 10
So is the Departure -- 354 ---- 2.549003
So the Sine Course 28.20 ---- 2.676264

as Radius ------ 90.00 ---- 10
Is to the Distance --- 746 ---- 2.872739
So is S W Course --- 61.40 --- 2.944582
So the x of Latt'd 656.7 ---- 2.817321

60 | 656 | 10.56
60
56

Island of Madeira Latt. 32.23 N
x of Latt'd 10.56 N
Latt'd in 43.19 N

A Ship from Whitby Sails 345 Miles between the North & the East when she is by Observation in Latt.d 58 North I demand her Course and Departure



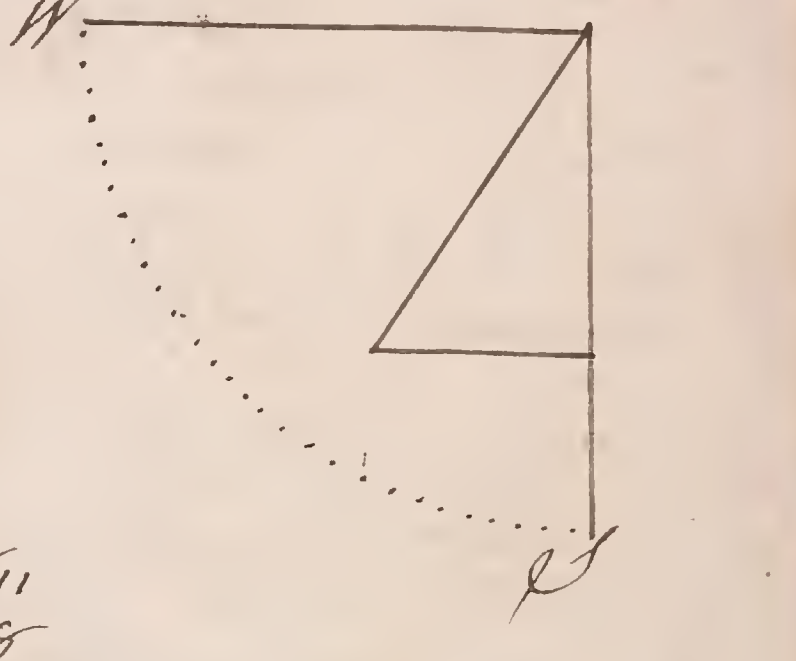
Whitby Latt.e 54°29 N
Latt.e obs.t 58°00 N
03°31

D.e of Latt.e 60
211

as the Distance --- 345 ---- 2·537819
Is to Radius --- 90°00 --- 10
So is the D.e of Latt.e --- 211 --- 2·324282
To the S.C Course 37°42 — 9·789463

as Radius ---------- 90°00 --- 10
Is to the Distance --- 345 ---- 2·537819
So is Sine Course ---- 52°18 --- 9·898299
To the Departure 273.0 — 2·436118

A Ship from the Rock of Lisbon Sails between the South & the West till her Departure be 284 Miles when she is by Observation in Latitude 31°56 N: I demand her Course and Distance



Lisbon Rock Latt.e 38°52 N
Latt.e in 31°50 N
7°02

D.e of Latt.e 60
422

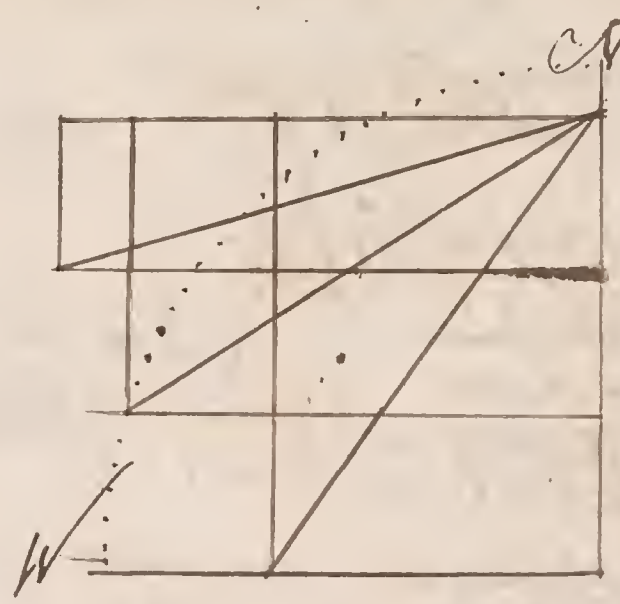
as the D.e of Latt.e ---- 422 ---- 2·625312
Is to Radius ---- 90°00 ---- 10
So is the Departure --- 284 ---- 2·453318
To the S Course 32°56 — 9·828006

as Sine Course ------ 32°56 ---- 9·746811
Is to the Departure --- 284 ------ 2·453318
So is Radius ------- 90°00 ----- 10
To the Distance 508.8 — 2·706507

Ans.r her Course is SWbS Distance 208.8 miles

Suppose that three ships are all bound to one Port one Ship is in the Latitude of 20 North the Second in Latt 30 North and the third in Latitude 40 North the Port Lies in the Latt of 50 North and they all sail one Distance 740 Leagues I demand their several Courses and Departures

50	50	50	
20	30	40	740
30	20	10	3
60	60	60	2220
1800	1200	600	



As the Distance ---- 2220 ---- 3346353
Is to Radius ---- 90°00' ---- 10
So is the x of Latt ---- 1800 ---- 3255272
To the S C Course 54°11' 2908919
S C 90°00'
35°49'

as the Distance ---- 2220 ---- 3346353
Is to Radius ---- 90°00' ---- 10
So is the x of Latt ---- 1200 ---- 3079181
To the S C Course 32°43' 2732828
S C 90°00'
57°17'

as the Distance ---- 2220 ---- 3346353
Is to Radius ---- 90°00' ---- 40
So is the x of Latt ---- 600 ---- 2778151
To the S C Course 15°40' 2891798
S C 90°00'
74°19'

as Radius ---- 90°00' ---- 10
Is to the Distance ---- 2220 ---- 3346353
So is Sine Course ---- 35°49 ---- 9765544
To the Departure 1294 3111897

as Radius ---- 90°00' ---- 10
Is to the Distance ---- 2220 ---- 3346353
So is Sine Course ---- 57°17' ---- 9924979
To the Departure ---- 1866 3271332

as Radius ---- 90°00' ---- 10
Is to thee Distance ---- 2220 ---- 3346353
So is Sine Course ---- 74°19 ---- 9983523
To the Departure 2137 3329876

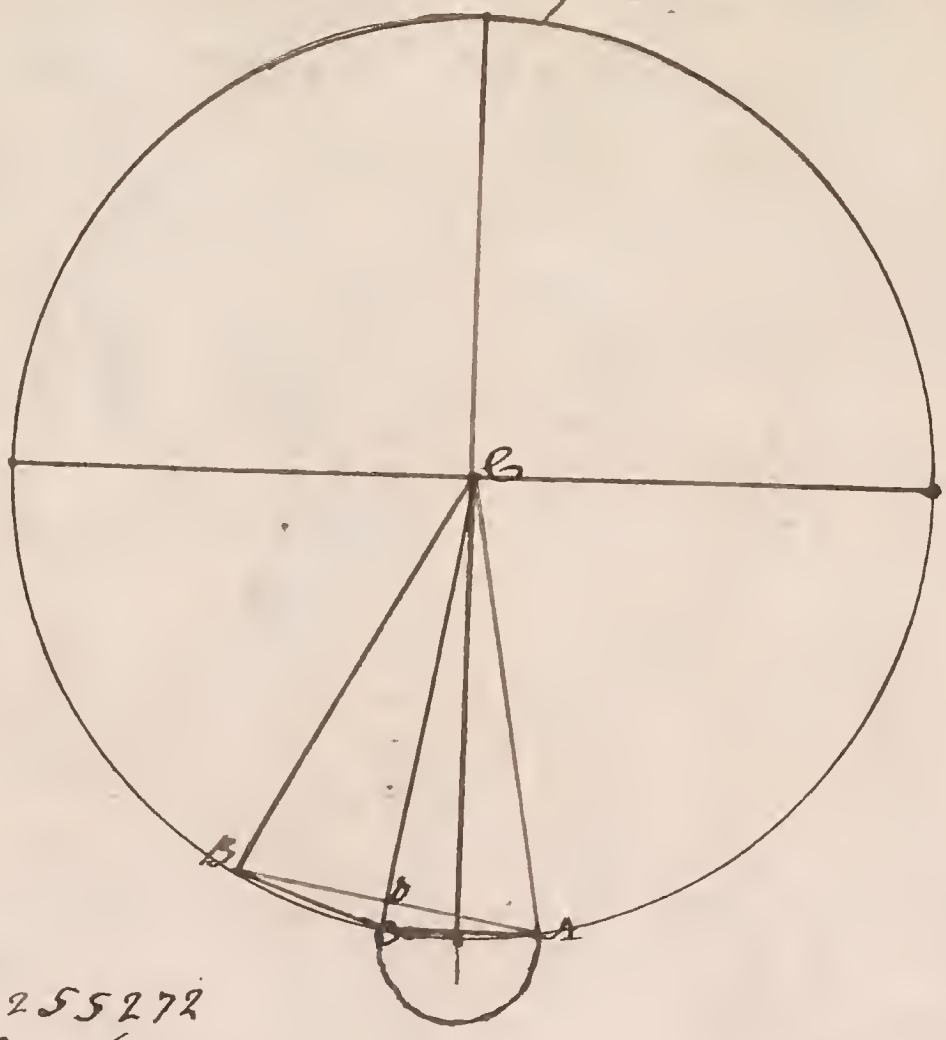
There is a round Lake whose Diameter is 360 miles upon the Coast of which lie two Ports A and B whose nearest Distance in a straight Line is 120 miles but their Bearing or Situation is not known a Ship at A sails away West 64 miles and then arrives at another Port O and at the Port O he takes in goods for B I demand what Course he must steer to find the Port at B

½ 360 ½ 120
180 60

19° 28′ 10° 14′
19° 28′ 10° 14′
38° 56′ 20° 28′
38° 56′ 28.9
20° 2′ 57.9 BO
½ 18° 42′
9° 14′

57.9
64
12.8

126
63
½ 126
63.1 AD
56.9 BD



as Side BC ------ 180 ------ 2.255272
Is to Radius ------ 90°00′ ---- 10
Jous Side AB ------ 60 ------ 1.778151
To Line ∠C 19° 28′ 9.522879

as Side BC ------ 180 ------ 2.255272
Is to Radius ------ 90°00′ ---- 10
Jous Side AO ------ 32 ------ 1.505150
To Line ∠C 10° 14′ 9.249878

as Radius ------ 90°00′ ---- 10
Is to Side BC ------ 180 ------ 2.255272
Jous Line ∠C ------ 9° 14′ ------ 9.205354
To Side BO 28.8 1.460626

as the Base ------ 120 ------ 2.079181
Is to the Sum of the 2 other Sides ------ 121.6 ---- 2.084934
Jous their Semi ------ 62 ------ 1.792392
To the 2 Segments of the Base 2.877326
1.796045

as Side AO ------ 64 ------ 1.806180
Is to Radius ------ 90°00′ ------ 10
Jous Side AD ------ 63.4 ------ 1.800029
To Line ∠O 86° 22′ 9.993849
90°00′
∠A 3° 38′

as Side BO ------ 57.6 ------ 1.760422
Is to Radius ------ 90°00′ ------ 10
Jous Side BD ------ 56.9 ------ 1.755112
To Line ∠O 71.3 9.794690
90°00′
∠B 18° 30′

86° 22′
3° 38′
82° 44′

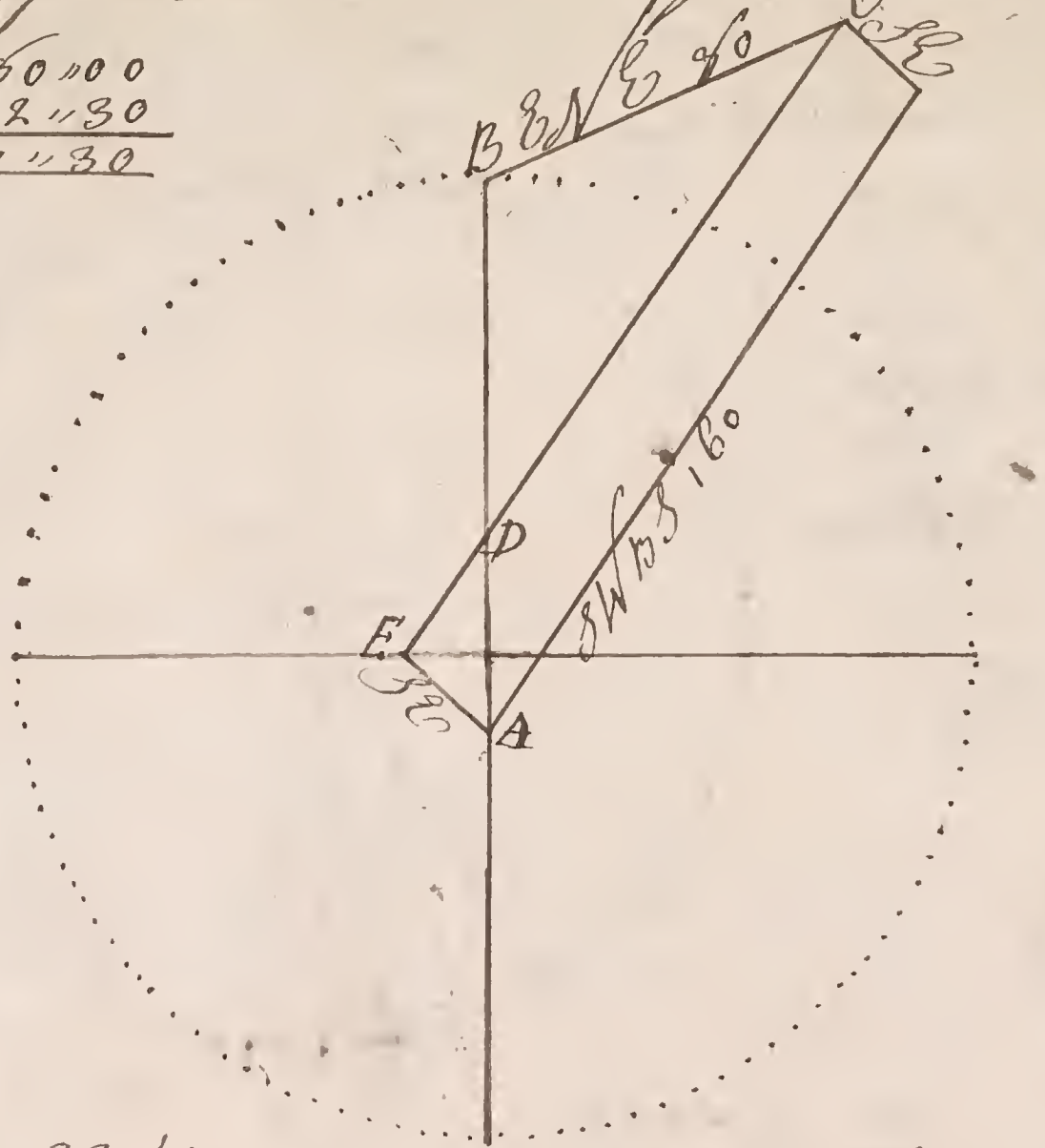
(Ans[r] her Course is W. ½ N. W. ½ W. Distance 57.6 miles

Suppose a Ship sails N a certain Distance then E N E 80 miles and S E a certain Distance Lastly S W B S 160 miles and then is found in the first Place she sailed from I demand how many miles she sailed N and S E

90 ″ 00
22 ″ 30
∠DBC 121 ″ 30
∠BCD 33 ″ 45
146 ″ 15
180 ″ 00
∠BDC 33 ″ 45

160
133
27

180 ″ 00
112 ″ 30
67 ″ 30



as ∠BDC ---------- 33 ″ 45 ---- 9.144739
Is to Side BC ---------- 80 ---------- 1.903090
So is Sine ∠BCD ---- 33 ″ 45 ---- 9.744739
To Side BC 80 11.647829
1.903090

Dist 80
37.39
117.89 Sailed North

as Sine ∠BDC ---------- 33 ″ 45 ---------- 9.144739
Is to Side BC ---------- 80 ---------- 1.903090
So is Sine ∠DBC ---- 67 ″ 30 ---- 9.965615
To Side DC 1330 11.968705
2.123966

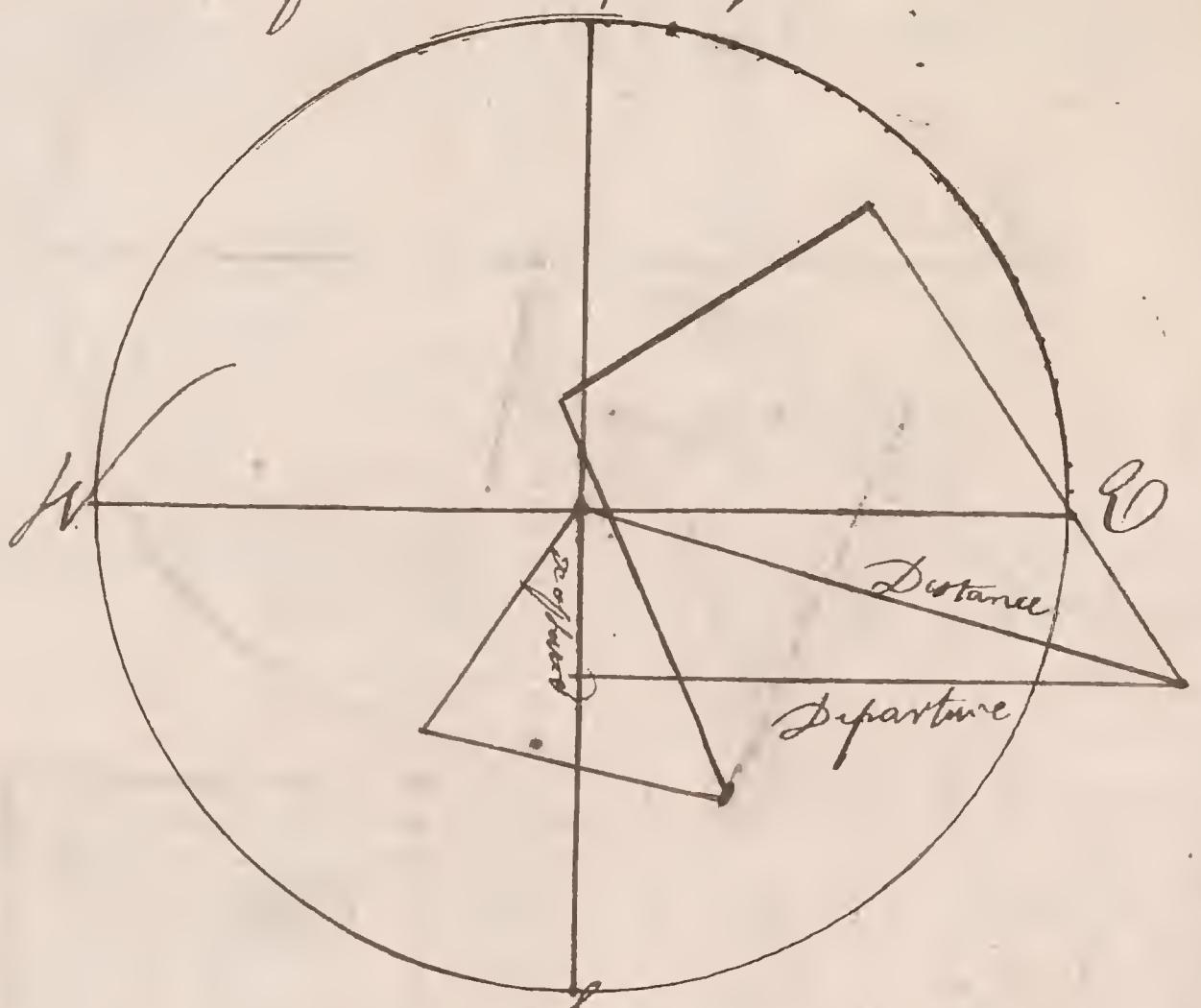
Dist 2121 Sailed S E

as Sine ∠DAE ---- 45 ″ 00 ---- 9.649485
Is to Side ED ---------- 27 ---------- 1.431364
So is Sine ∠ADE ---- 33 ″ 45 ---- 9.744739
To Side AE 21.21 11.176103
1.326618

as Sine ∠DAE ---------- 45 ″ 00 ---- 9.849485
Is to Side ED ---------- 27 ---------- 1.431364
So is Sine ∠AED ---- 78 ″ 45 ---- 9.991574
To Side AD 37.39 11.422936
1.573953

Traverse Sailing. Febr. 8th 1759.

A Ship Sails first SWbS 56 Miles then EbS 64 Miles then NNW 87 Miles then NEbE 74 Miles and then SEbS 117 Miles I demand her Direct Course difference of Latitude Departure & Distance

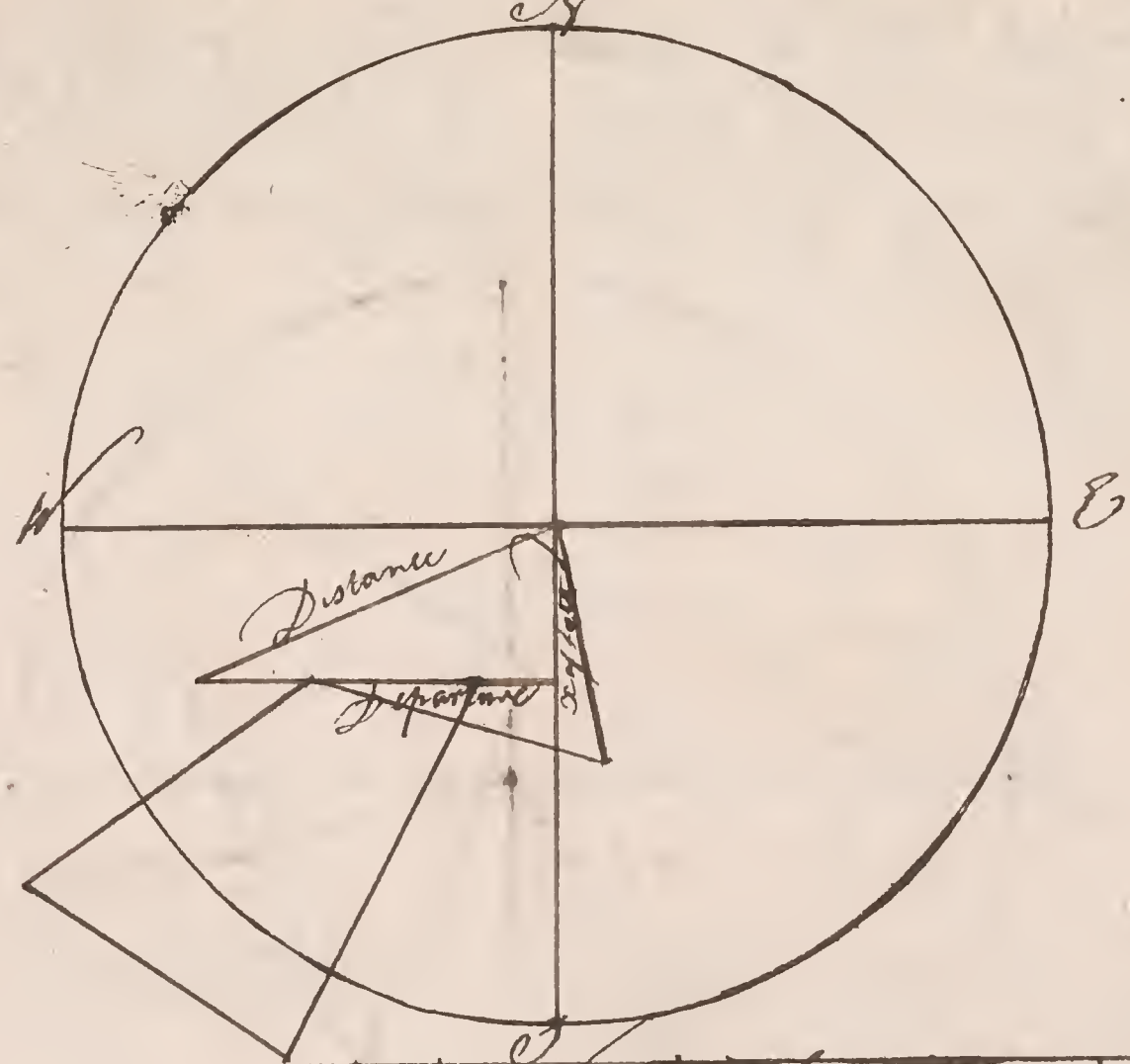


Courses	Points	Distances	N / S	Difference of Latitude	E / W	Departure
SWbS	3	56		46.6		31.1
EbS	7	64		12.5	62.8	
NNW	2	87	80.4			
NEbE	5	74	41.1			33.3
SEbS	3	117			61.5	
				97.2	65.0	
			121.5	156.3	189.3	64.4
				121.5	64.4	
				34.8	124.9	

as the Diff of Lat 34.8 ... 1.541579
Is to Radius ... 90.00 ... 10
So is the Departure 124.9 ... 2.096562
To the S Course 74.25 ... 10.554983

as Sine Course 74.25 ... 9.983735
Is to the Departure 124.9 ... 2.096562
So is Radius ... 90.00 ... 10
To the Distance 129.7 ... 2.112827

a Ship in Latt. 48° 30 North Sails first 48 Miles SbE, then WNW ½ W 62 Miles then SW ¾ W 71 Miles then SbE 64 Miles then NNE ½ E 84 Miles & then due West 56 Miles I demand her direct Course diff of Latt. Departure & Distance with the Latt. now in ——



			N	S	E	W
			x of Latt		Departure	
SbE	1	48	1		09.4	
WNW ½ W	6 ½	62	18.0			59.3
SW ¾ W	4 ¾	71		42.2		57.0
SEbE	5	64		35.6	53.2	
NNE ½ E	2 ½	84	71.4		39.6	
W	8	56				56
			92.1	125.0	102.2	172.3
				92.1		102.2
				32.9		70.1

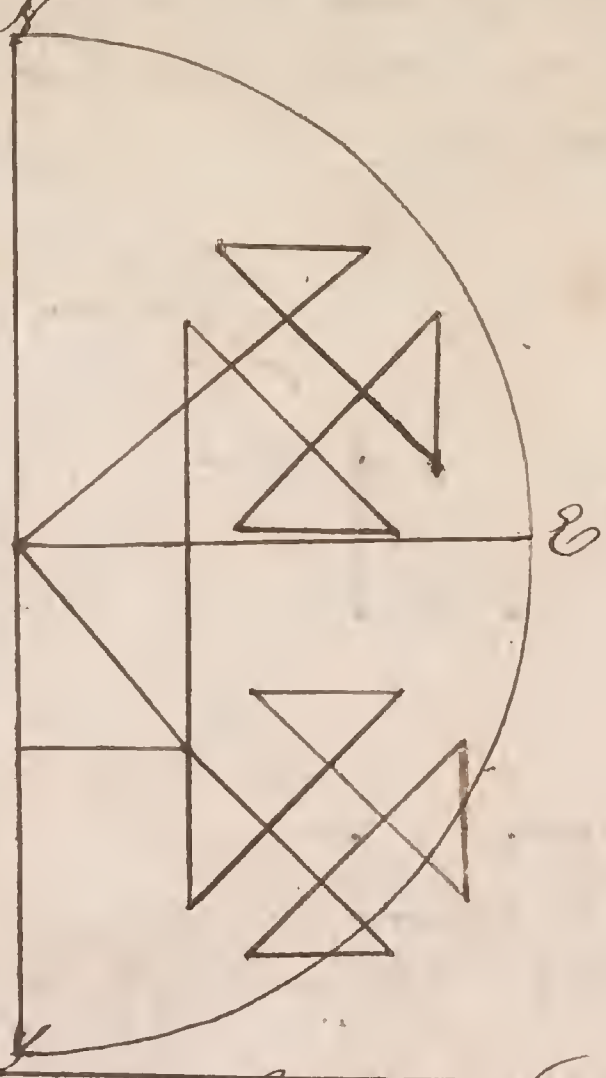
as the x of Latt 329 — 1.517196
Is to Radius — 90 1.00 — 10
So the Departure 701 — 1.845718
To the Course 64 1/2 — 10.328522

as Sine Course 64 1/2 — 9.956803
Is to the Departure 701 — 1.845718
So is Radius 90 1.00 — 10
To the Distance 771.3 — 1.888915

Latt from 48 30 N
x of Latt 32.9
Latt in 47 57.1 N

A Ship from the Latt 45°30 S Sails as follows viz NE 89m W 30m SE 59m N 30m SW 59m E 30m NW 59m S 115m NE 59m W 00m SE 59m N 30m SW 59m E 30m NW 59m I demand the rest

Latt from 45°30 S
x of Latt 33 S
Latt in 41°57 S

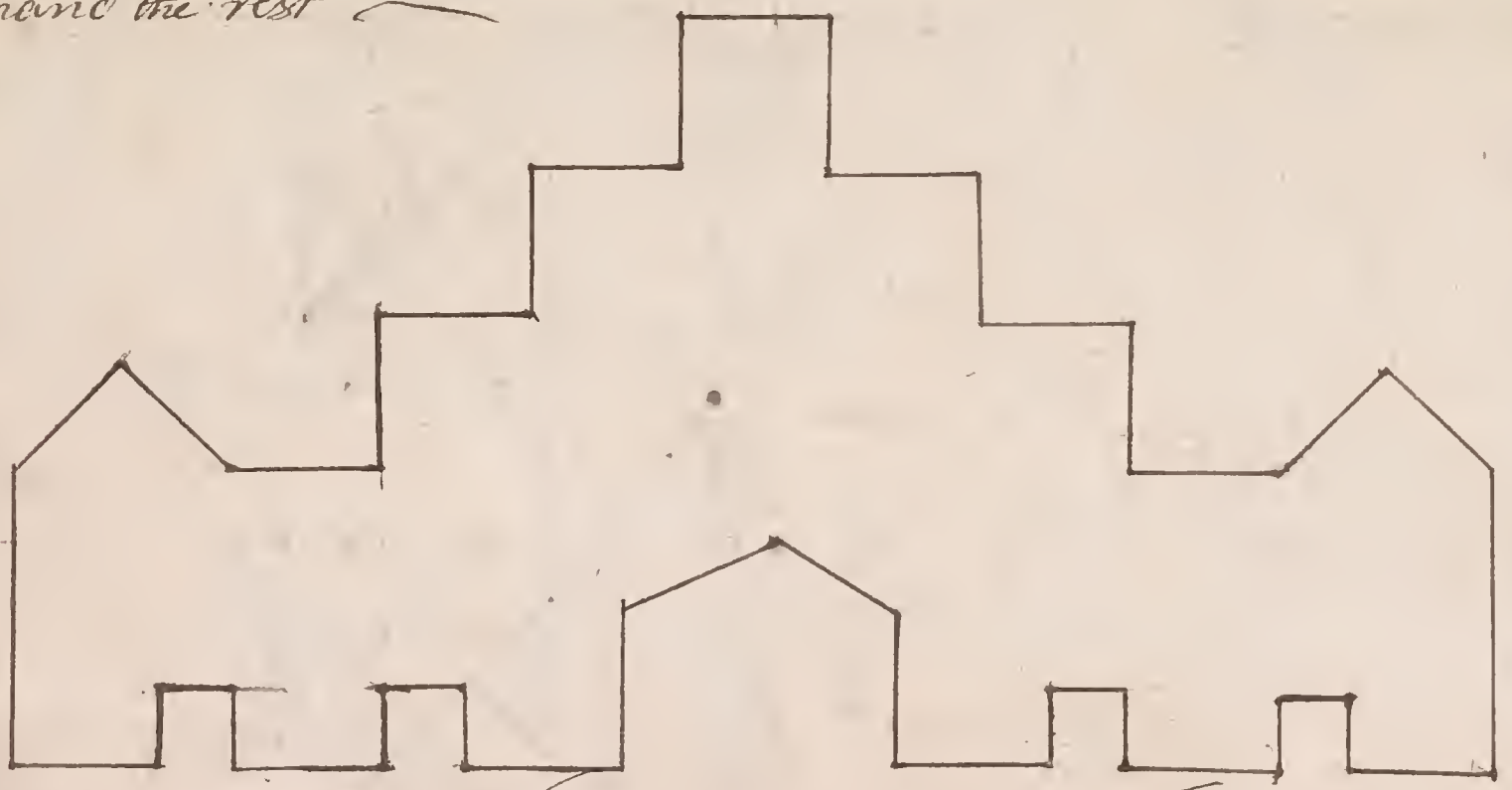


Courses	Points	Distance	N	S	E	W
			x of Latt		Departure	
NE	4	89	62.9		62.9	
W	8	30				30
SE	4	59		41.7	41.7	
N	0	30	30			41.7
SW	4	59		41.7		
E	8	30			30	
NW	4	59	41.7			41.7
S	0	115		115.0		
NE	4	59	41.7		41.7	
W	8	30				30
SE	4	59		41.7	41.7	
N	0	30	30			
SW	4	59		41.7		41.7
E	8	30			30	
NW	4	59	41.7			41.7
			248.0	284.8	248.0	226.8
				248.0	226.8	
				36.8	21.2	

As the x of Latt 33 S --- 1.526917
Is to Radius 90°00 --- 10
So is the Departure 21.2 --- 1.326336
To the I Course 32°6 --- 9.799419

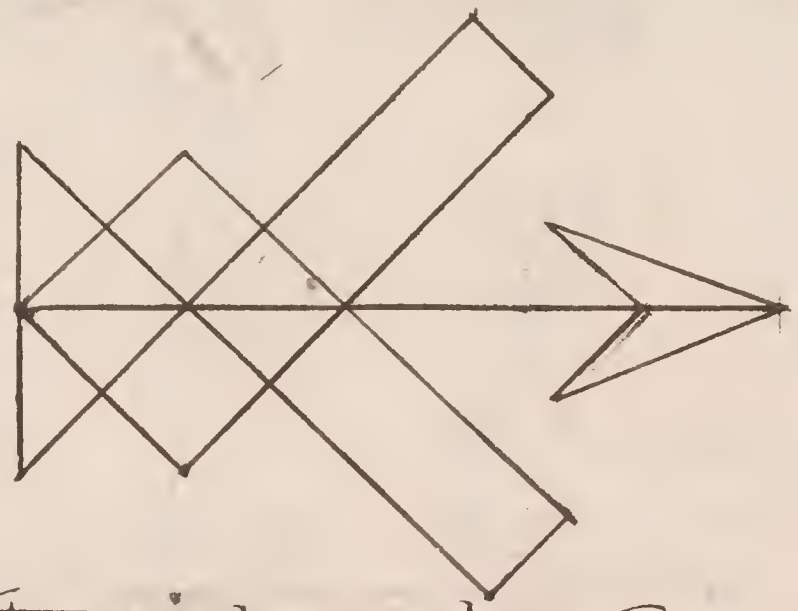
As the Course 32°6 --- 9.725420
Is to the Departure 21.2 --- 1.326336
So is Radius 90°00 --- 10
To the Distance 39.9 --- 2.600916

Admit a ship from the Latd 45 S sails viz SEBE 18m S20m E21m N10m E10m S10m E21m N10m E10m S10m E20m N40m NW20m SW20m W20m N20m W20m N20m W20m S20m W20m S20m W20m S20m W20m NW20m SW20m S40m E20m N10m E10m S10m E20m N10m E10m S10m E21m N20m NEBE18m I demand the rest



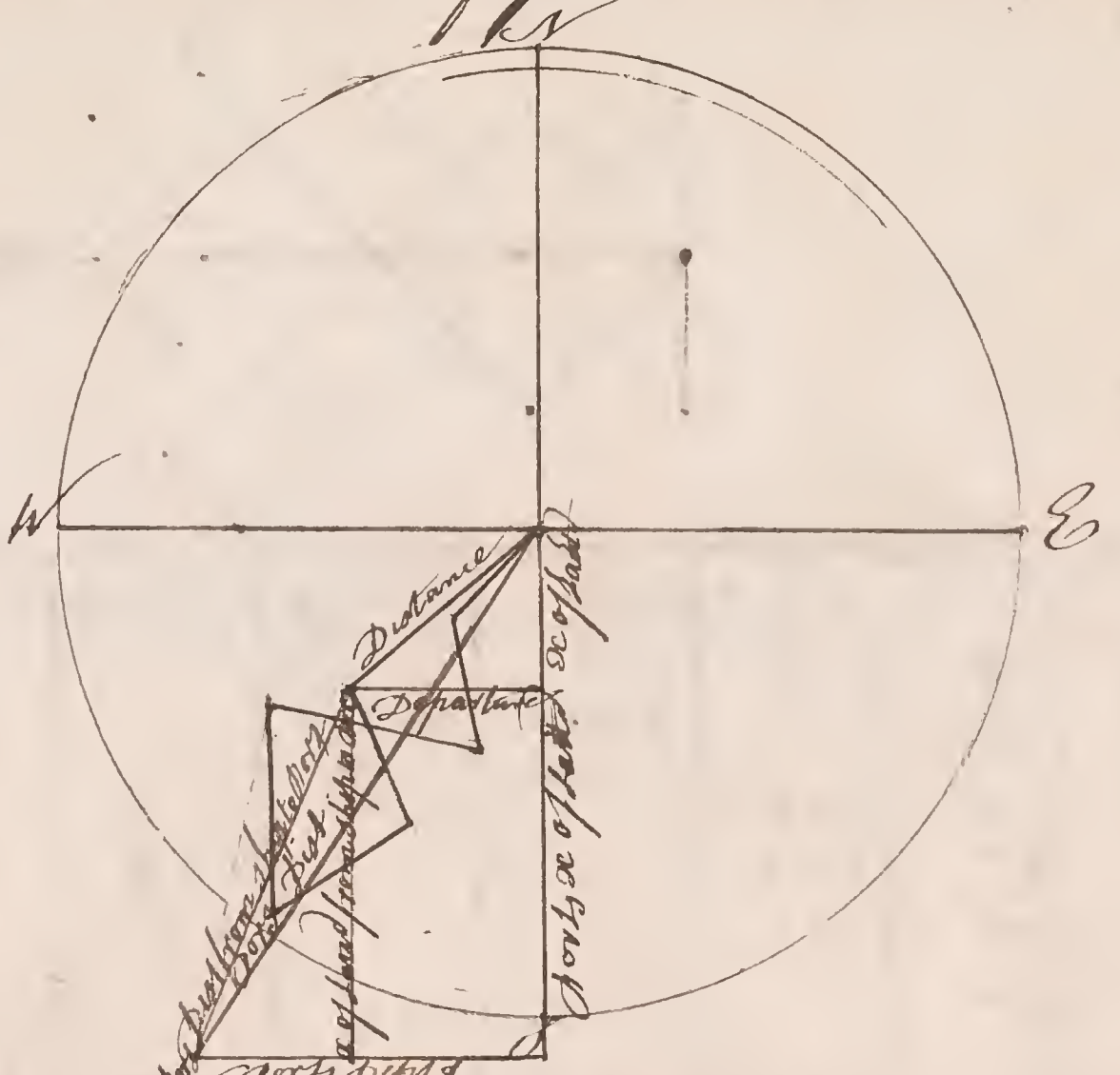
Courses	Points	Distance	N of Latd	S	E Departure	W
SEBE	5	18		10.0	150	
SE	0	20		20		
ESE	0	21			29	
NE	0	10	10	10		
ENE	0	10			10	
ESE	0	10			21	
NE	0	21	10			
ENE	0	10			10	
SE	0	10			20	
NNW	0	20				14.1
NW	4	40	40			
WNW	4	20	14.1	14.1		14.1
NW	0	20	20			20
NW	0	20				20
NW	0	20	20			20
NW	0	20				20
SW	0	20	20			
SW	0	20		20		20
SW	0	20		20		20
WSW	0	20		20		14.1
WNW	4	20	14.1			14.1
NW	4	20		14.1		
SE	0	40		40		
NE	0	20			20	
ESE	0	10			10	
SE	0	10		10		
NE	0	20	10		20	
ENE	0	10			10	
SE	0	10	10	10		
N	0	20	20		21	
NEBE	5	18	10.0		15.0	
			1982	1982	1930	1964
			1962			1930
						34

Admit a Ship from the Latd of 30 N sail these Courses viz N 21 m SE 85 m NE 15 m NW 70 m SW 30 m SE 30 m NE 70 m NW 15 m SW 55 m N 21 m E 100 m WNW 34 m SE 19 m SW by E ½ E 34 m I demand the rest ——



Courses	Points	Distance	N	S	E	W
			Diff of Latte		Departure	
N	701	221	21			
S E	4 5	85		60.1	60.1	
N E	4	15	10.6		10.6	
N W	4	70	49.5			49.5
S W	4	30		21.2		21.2
S E	4	30		21.2	21.2	
N E	4	70	49.5		49.5	
N W	4	15	10.6			10.6
S W	4	85		60.1		60.1
N	0 8	21	21			
E		100			100.0	
W N W	6	34	13.0			13.4
S E	4	19		13.4	13.4	
S W	4	19		13.4		13.4
E N E	6	34	13.0		13.4	
			1662	1694	2679	1662
				1662	1662	
				12	996	

a Ship in Lat.d 50 North being bound to a Port that bears SWbS from her distant 260 Miles Sails first SW 18 Miles then SbE 56 Miles then WbN 78 Miles then S 87 Miles then NEbE 68 Miles & then NNW 58 Miles I demand her direct Course diff of Lat.d Departure and Distance with the Lat.d now in as also the Bearing & Distance of y.e Port she is bound to



Courses	Points	Distances	N ∝ of Lat.d	S	E Departure	W
SW	4	48		33.9		33.9
SbE	1	56		54.9	10.9	
WbN	7	78	15.2			76.5
S	0	87		87		
NEbE	5	68	37.8		56.5	
NNW	2	58	53.6			22.2
			106.6	175.8	67.4	132.6
				106.6		67.4
				69.2		65.2

as the x of Latt ---- 69.2 ---- 1.840106
Is to Radius ---- 90°00' ---- 10
so is the Departure ---- 65.2 ---- 1.814248
Jo the I Course 43°16' 9.974148

as I Course ---- 43°16' ---- 9.836209
Is to the Departure 65.2 ---- 1.814248
so is Radius ---- 90°00' ---- 10
Jo the Distance 95.02 1.978039

I C 90°00
33°45
I C C 56°15

as Radius ---- 90°00 ---- 10
Is to the Distance ---- 260 ---- 2.414973
so is I Course ---- 33°45 ---- 9.744739
Jo the Departure 144.5 2.159712

Dorts 144.5 Dept d
Jravis 65.2 Dept d
79.3

as Radius ---- 90°00 ---- 10
Is to the Distance ---- 260 ---- 2.414973
so is I C Course ---- 56°15 ---- 9.919846
Jo the x of Land 216.2 2.334819

Jravis x of Land 216.2
Dorts x of Latt 69.2
147.0

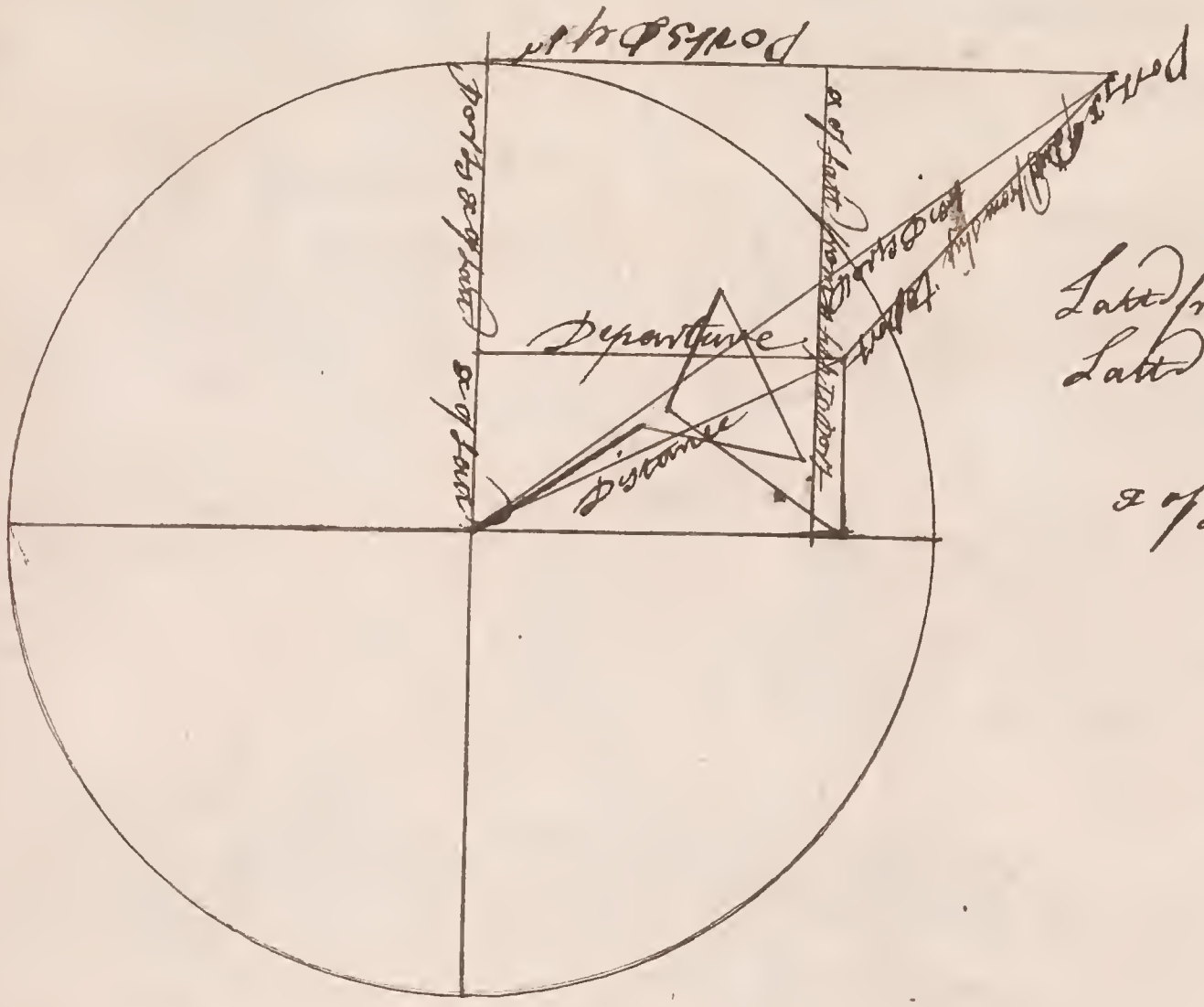
as the x of Land ---- 147 ---- 2.167317
Is to Radius ---- 90°00' ---- 10
so is the Departure ---- 79.3 ---- 1.899273
Jo the I Course 28°20 9.781956

60|69|1
60
9

As I Course ---- 28°20 ---- 9.676328
Is to the Departure ---- 79.3 ---- 1.899273
so is Radius ---- 90°00 ---- 10
Jo the Distance 167.1 2.222945

Latt from 58°00 N
x of Latt 01°09 S
Latt in 57°51 N

a Ship in Latt. 54° 29' North being bound to a Port that lies in Latt. 58° North distant 345 Miles Sails first N E b E 87 Miles then E b S 68 Miles then N N W ½ W 81 Miles then S S W 58 Miles then S E ¾ E 91 Miles & then N 75 Miles I demand her direct Course diff. of Latt. Depar. ture and Distance with the Latt. now in as also the Bearing & Distance of the Port she is bound to



Latt from 54° 29' N
Latt in 58° 00' N
3° 31'
60
Latt 211
754
1956

Courses	Points	Distances	N	S	E	W
			Diff. of Latitude		Departure	
N E b E	5	87	46.3		72.5	
E b S	7	68		13.3	66.7	
N N W ½ W	2 ½	81	73.2			34.6
S S W	2	58		53.6		22.2
S E ¾ E	4 ¾	91		54.2	73.1	
North	0	75	75.0			
			196.5	121.1	212.1	56.8
			121.1		56.8	
			75.4		155.3	

as the x of Latt ---- 754 ---------- 1877371
Is to Radius ---- 90°00' ---- 10
Is to the Departure --- 1553 --- 2.191451
10.3140 80

To the I Course 64°17

as I Course ---------- 64°17 ---- 2.954090
Is to the Departure ---------- 155.3 ---- 2.191451
Is to Radius ---------- 90°00 ---- 10
2.237361

To the Distance ---------- 1727

as the Distance ---------- 345 ---- 2537819
Is to Radius ---------- 90°00 ---- 10
Is to the x of Latt ---------- 911 ---- 2.324282
2.786463

273.0
155.3
117.7

To the I C Course 37°42
90°00
52°18

as Radius ---------- 90°00 ---------- 10
Is to the Distance --- 346 ---- 2537819
Is to I Course ---------- 52°18 ---- 2.969899
2.436118

To the Departure 2730

as the x of Latt ---------- 1356 ---- 2.332260
Is to Radius ---------- 90°00 ---- 10
Is to the Departure --- 1177 --- 2.070776
2.993036

To the I Course 40°56

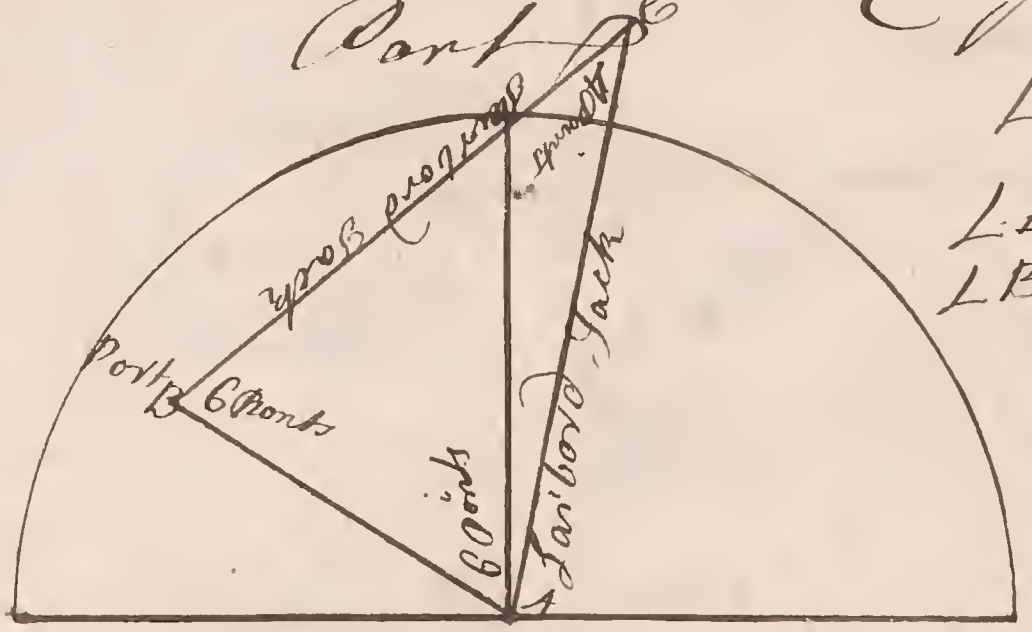
as I Course ---------- 40°56 ---- 9.816652
Is to the Departure --- 1177 ---- 2.070776
Is to Radius ---------- 90°00 ---- 10
2.253428

To the Distance 179.6

Oblique Sailing. 1759.

a Ship that can Sail within 6 points of y Wind is bound to a Port that bears NW b W from her distant 16 Miles directly to Windward & demand her Course & Distance on each Tack to gain this Port

L B 6
L A 6
12
16
4 L 6



L 6 4 5
L A 67½ 0
L B 67½ 0

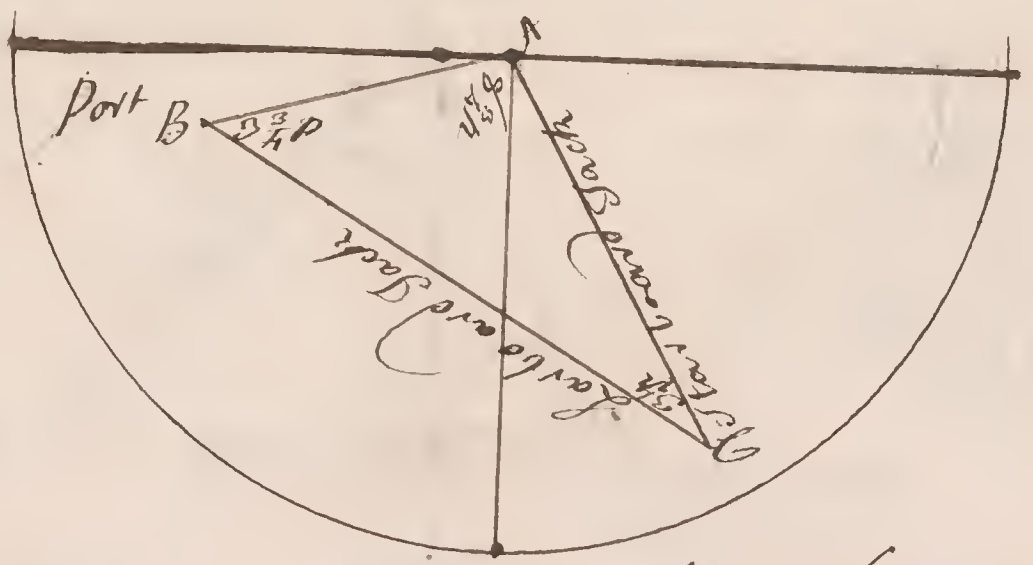
as S L C ---------- 45ᵈ 00 --- 9.849485
I s to Side B C ---- 16 ------ 1.204120
I o u s I L B ------ 67½ 0 - 9.965615
11.169735
I o Side A B 2.092
1.320250

Ans. her Course Is on the Starboard Tack N B E
Dist 2.092 miles on the Starboard Tack is S W B W Distance 2.092 M

A Ship that can Sail within 6 1/4 points of the Wind which is at SW is bound to a Port that bears WSW 1/2 W from her distant 25 Miles I demand her Course and Distance on each Tack to gain this Port?

L A 6 11 3/4
L B 3 11 0/4
12 11 1/2
L C 16
3 11 1/2

6 11 3/4
16
7 11 1/4



as S L C ---------- 39 11 22 ---------- 9.6022682
I. to Side A B ---------- 25 ---------- 1.397940
I. to S L A ---------- 6 1 3/4 ---------- 2.995278
11.393216
I. to Side B C 3 6.99 1.590936

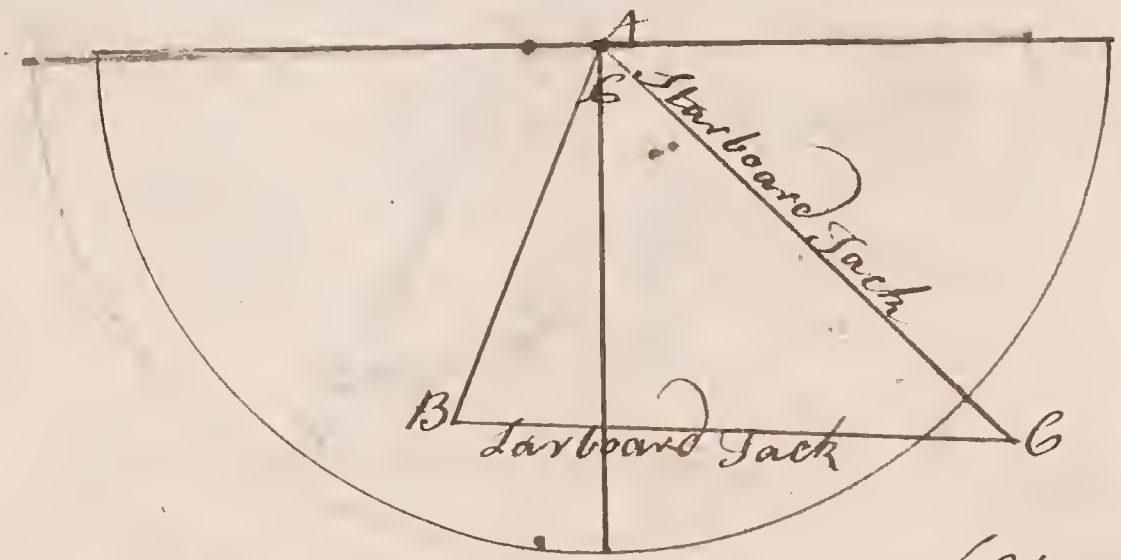
as S L C ---------- 39 11 22 ---------- 9.6022682
1.397940
I. to Side A B ---------- 25 ---------- 9.627049
I. to S L B ---------- 42 11 1 ---------- 11.224969
I. to Side A C ---------- 26.47 ---------- 1.422707

Ans. her Course is on the Starboard Tack S S E 1/4 E Dist 26.47 miles on the Larboard Tack N W B W 1/2 W Dist 3 6.99 miles

A Ship being bound to a Port that bears SSW from her distant 32 Miles Sails 32 45 Miles on her Starbord Tack I demand her Course & Distance on her Larbord Tack to gain her Port

180°00
∠A 67°30
2 | 112°30
56°15
14°11
∠C 42°04
36°15
∠B 14°11
70°26

32
45
77
13



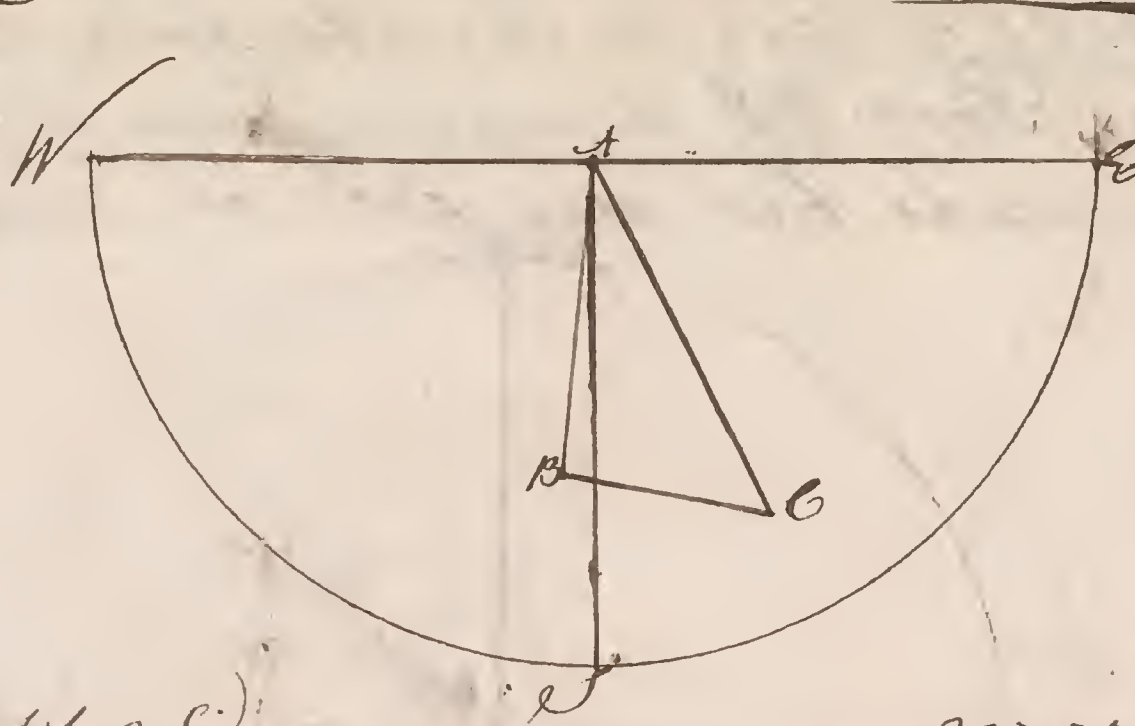
as the Sum of y^e other 2 Sides ---------- 77 ---------- 1.886491
So is their ex ---------- 13 ---------- 1.113941
So is y^e D of ½ the Sum of their opp^t Ls --- 56°15 ---- 10.175107
So is ye D of ½ the ex of thes Ls ---------- 14°11 ---- 11.289050
9.402559

as ∠B ---------- 70°26 ---------- 9.974167
So is Side A C ---------- 45 ---------- 1.653212
So is ∠A ---------- 67°30 ---------- 9.965615
11.618827
So is Side B C ---------- 44°12 ---------- 1.644660

Ans^r her Course is WBS ½ W Distance 44.12 miles

A Ship sails by the Log SSE 78 Miles in a Current that sets in the same Time WbN 41 Miles I desire her true Course and Distance

76
41
119
57



180°00
56°15 L C
2 | 123°45
61°52
30°11
92°03 | B
61°52
30°11
31°41 L A

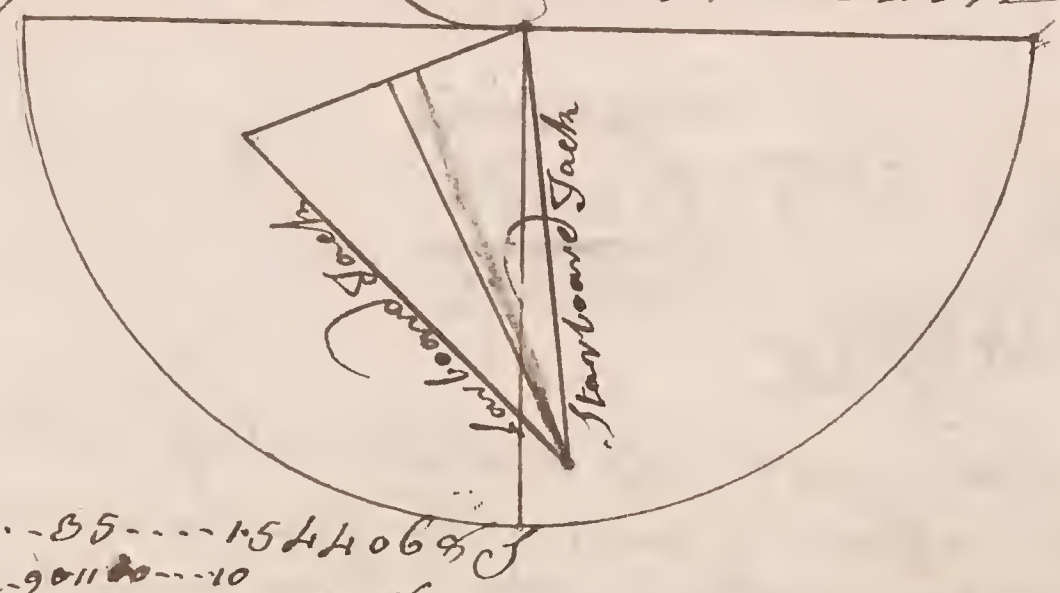
as the Sum of the 2 Sides ---------- 119 ---------- 2.075547
Is to their Diff ---------- 57 ---------- 1.756202
So is the Tang ½ Sum of its Opp Ats ---- 61°52 ---------- 10.271891
To the Tang ½ Diff of the Ats ---------- 30°11 ---------- 9.764546

as S L A ---------- 31°41 ---------- 9.720345
Is to Side B C ---------- 41 ---------- 1.612784
So is L C ---------- 56°15 ---------- 9.919846
To Side A B ---------- 36.49 ---------- 1.532630

Ans^d her Course S ¾ W Distance 36.49 miles

A Ship being bound to a Port that bears WSW from her distant 24 Miles directly to Windward by Sailing 35 Miles on each Tack gains her Port I desire her Course on each Tack

& 1/24 / 12

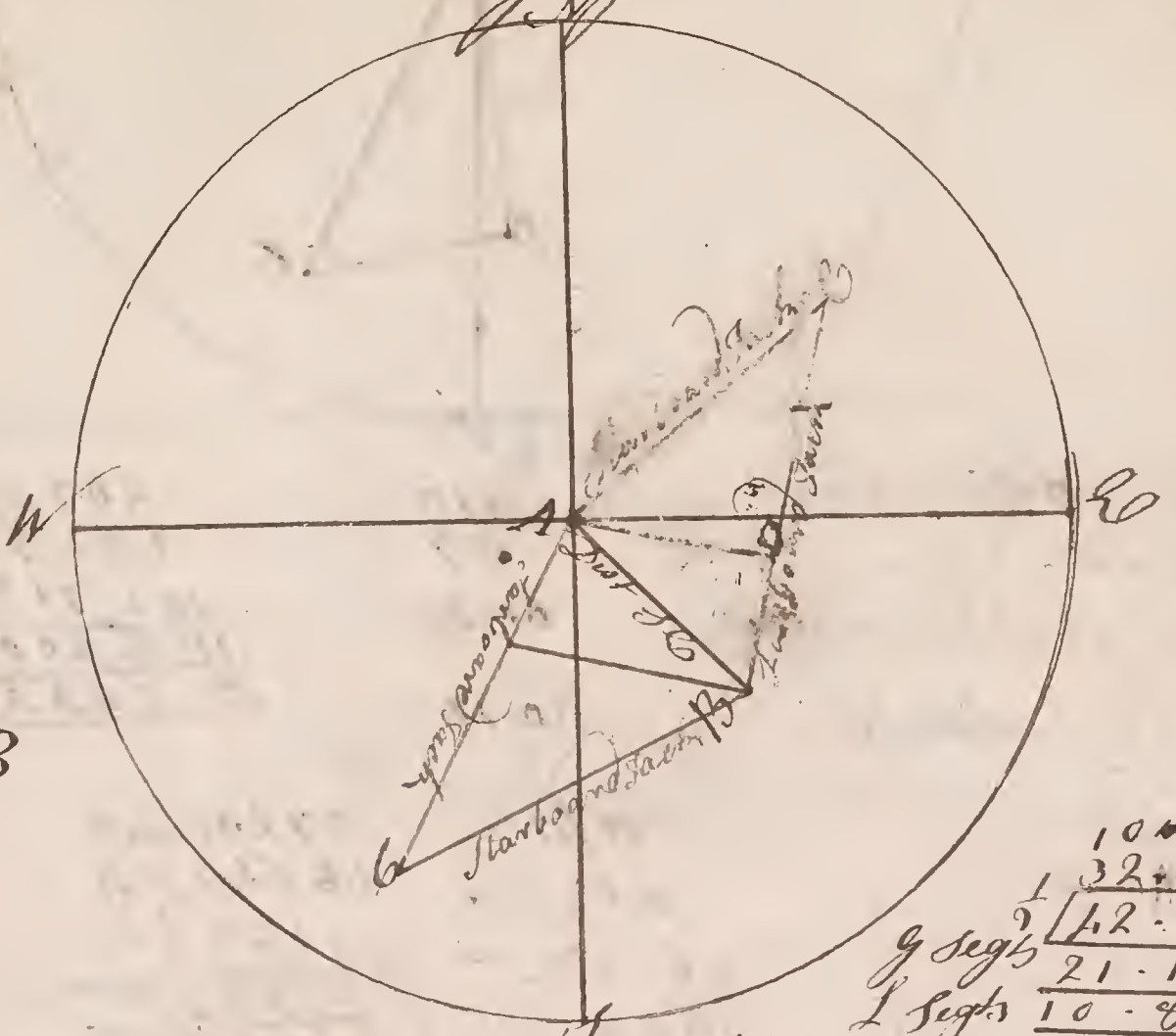


as Side A B ---- 35 ---- 1.544068
Is to Radius ---- 90°00 ---- 10
So is Side A C ---- 12 ---- 10.791861
To L B ---- 20°03 ---- 9.535113
69°57

Ans^d her Course is on Starboard Tack S ¼ E her Course on the Larboard Tack NW B W ¾ W

A Ship being bound to a Port that bears S.E. from her distant 20 Miles directly to windward by Sailing 32 Miles on her Larboard Tack and then 27 Miles on her Starboard Tack she gains her Port I demand how near the Wind she made her way good on each Tack

20 m
27
47
07



90°00
32°52
57°07 ∠B

90°00
57°32
32°28 ∠C

10·26
32·00
42·26 ½
21·13 DC
10·86 DB

as the Base BC	32	1.505150
Is to the Sum of the other 2 Sides	47	1.672096
So is their x	07	0.845096
		2.517196
To the x of the alternate base	10.26	1.012046

as Side AB	20	1.301030
Is to Radius	90°00	10
So is Side BD	10.86	1.035630
		2.736600
To Sine ∠A	32°53	

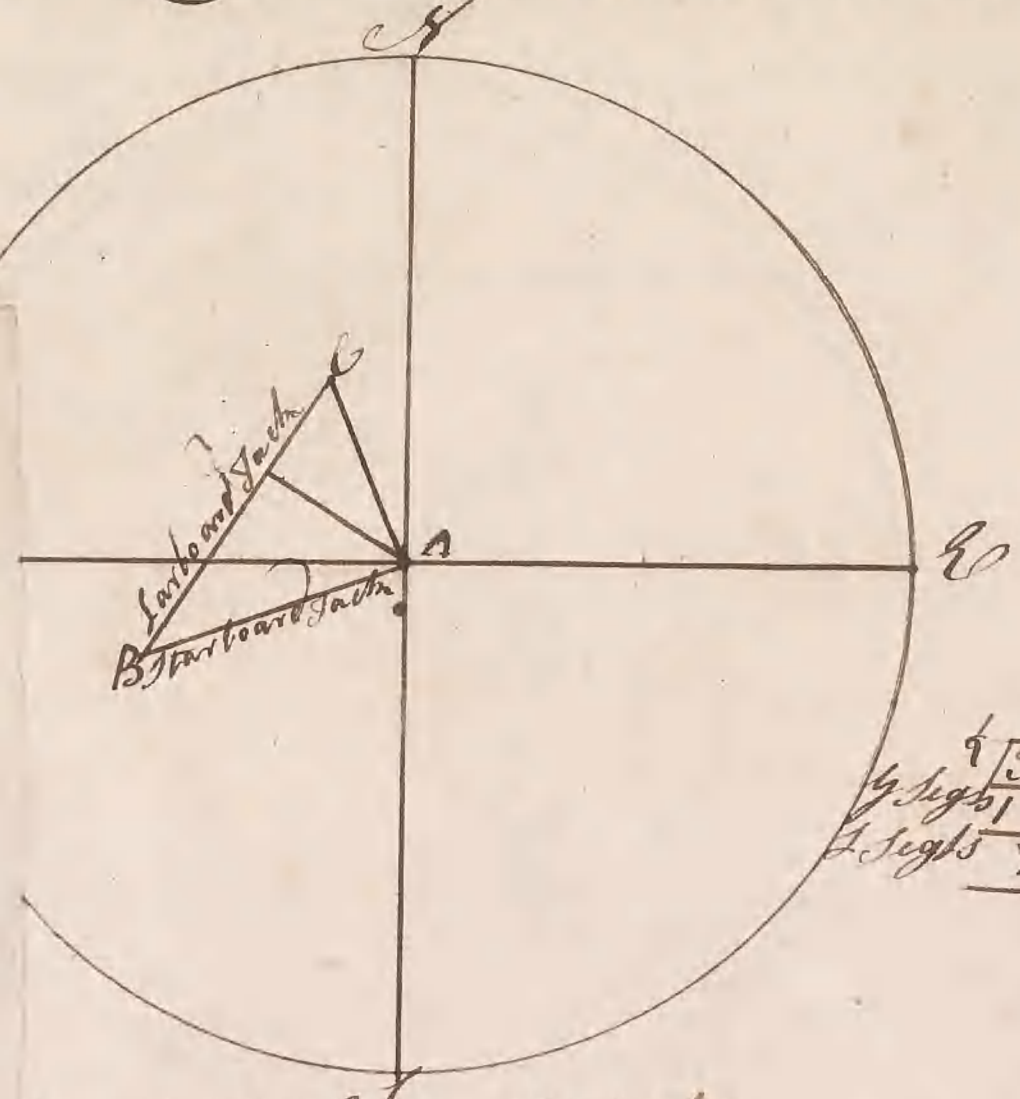
as Side AC	27	1.431364
Is to Radius	90°00	10
So is Side DC	21°13	1.325105
To Sine ∠A	51°32	9.693741

∠A 32°53
64°25

Ans. her Course is on the Starboard Tack N.E. ½ E. and makes her way good within 7½ points of the Wind her Course on the Larboard Tack is S.S.W. and makes her way good within 5 points of the Wind

a Ship being bound to a Port that bears
N NW from her distant 16 Miles by sailing
22 miles on her Starboard Tack and then 25
miles on her Larboard Tack gains her Port
I demand her Course steered on each Tack

16
22
38
6
90,00



25 9·12
½ 34·12
½ Segts 17·06
¼ Segts 7·94

Rule. As the Sine of 29° 05' the Logarithm of the Larboard Wake to the Sine of 90° the Logarithm to the Starboard Wake

Sine of 29° 05' ..... 1·39794
Sine of 38 ..... 1·57984
Sine of 0 6 ..... 0·77815
Base ..... 9·12 ..... 2·35793
0·95995

Sine of 22 ..... 1·32423
Sine of 90°00 10
Sine of 17·06 ..... 1·29979
50°51 ..... 2·88956

Sine of 16 ..... 1·20412
Sine of 90°00 10
Sine of 7·94 ..... 0·89962
29°46 ..... 9·69570
50°51
80°37

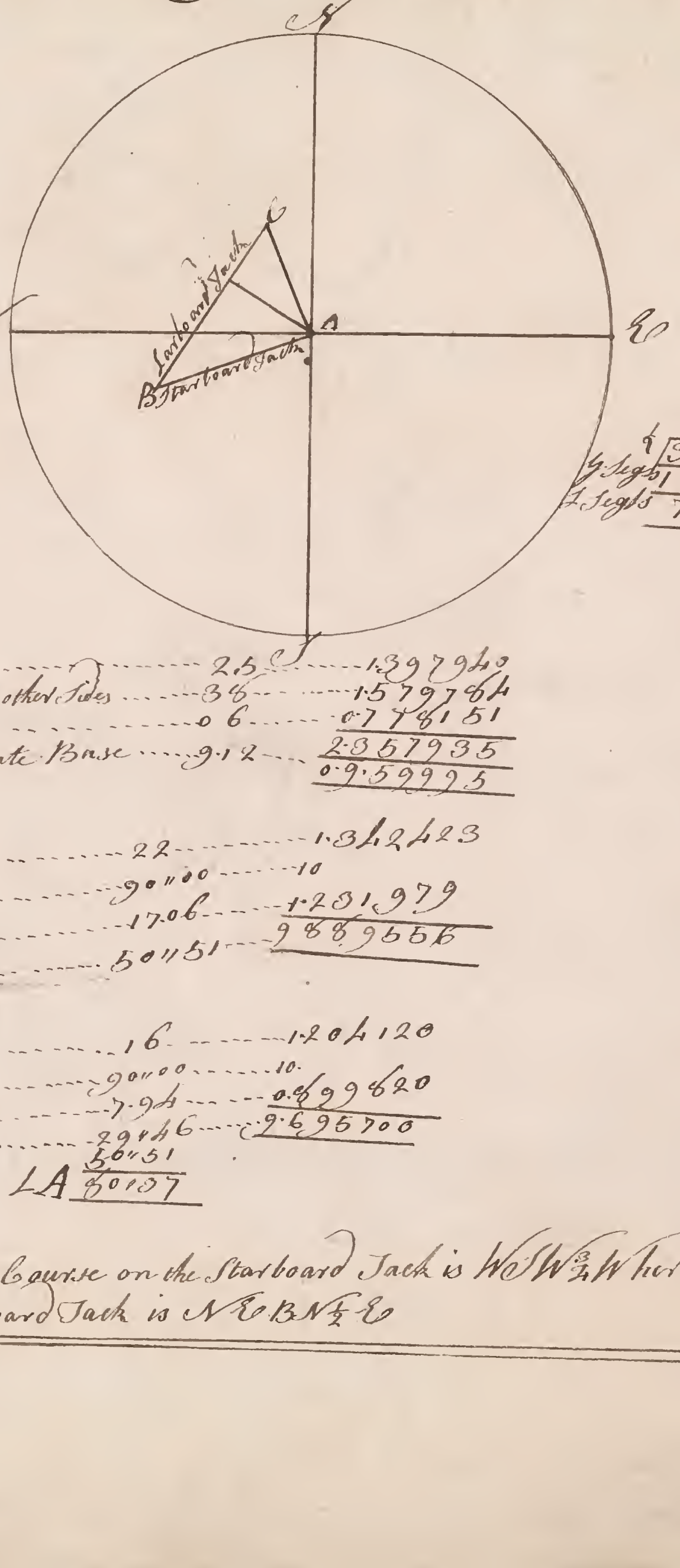
The Course on the Starboard Tack is W S W ¾ W her Course on
the Larboard Tack is N E B N ½ E

Rec.d Jan.y 29th 1765 of Mr. Mich.l Rockwood Mast.r of the
Garland of Whitby Twelve Shillings and Sixpence to be
accountable for ——— Lt. Sunderland

a Ship being bound to a Port that bears NNW from her distant 16 Miles by sailing 22 miles on her Starboard Tack and then 25 miles on her Larboard Tack gains her Port I demand her Course steered on each Tack

16
22
38
6

90°00
29°46
61°14 LC



90°00
50°51
LB 39°09

25
9·12
34·12
17·06
7·94

as Base BC ---------- 25 ---------- 1·397940
Is to 1st Sum of 1st 2 other Sides ---------- 38 ---------- 1·579784
So is their Diff ---------- 06 ---------- 0·778151
To the Co of 1st alternate Base ---------- 9·12 ---------- 2·357935
0·959995

as Side BA ---------- 22 ---------- 1·342423
Is to Radius ---------- 90°00 ---------- 10
So is Side BD ---------- 17·06 ---------- 1·231979
To Sine LA ---------- 50°51 ---------- 9·889556

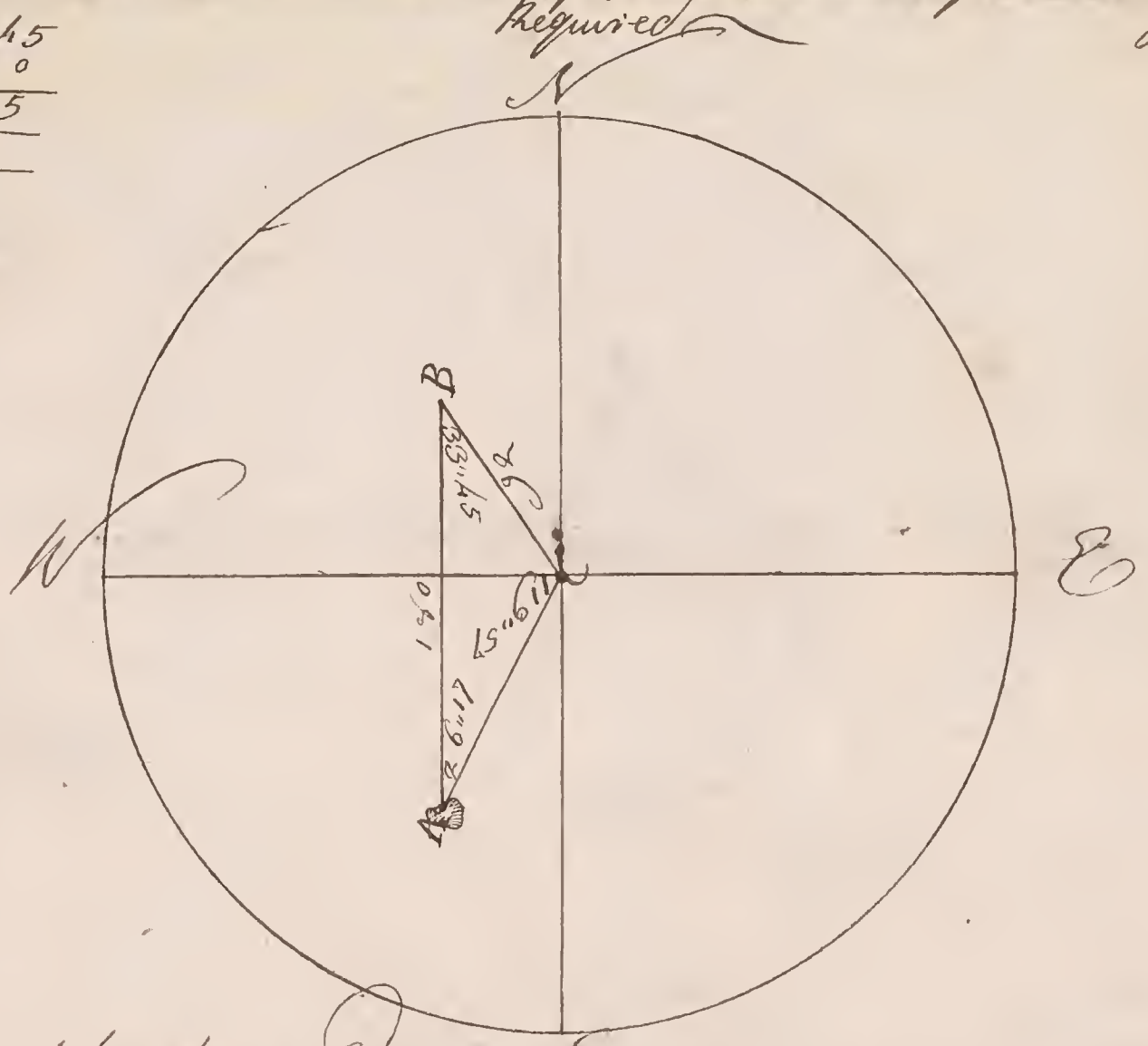
as Side of C ---------- 16 ---------- 1·204120
Is to Radius ---------- 90°00 ---------- 10·
So is Side DC ---------- 7·94 ---------- 0·899620
To Sine LA ---------- 29°46 ---------- 9·695500
50°51
LA 80°37

Ans 1st Course on the Starboard Tack is W S W 3/4 W 1st Course on the Larboard Tack is N E B N 1/2 E

I Being in a ship Bound to an Island and knowing neither the Course, Distance x of Latd & Departure but Heard the Master tell the mate that if he would sail N W B N 92 Leagues then the Island would Bear South Distance 160 Leagues the Course and Distance of the Island at first setting out is x &c.

L B 33° 45
160° 00
146° 15
½ Sum 73° 07

160
92
Sum 252
Difference 68

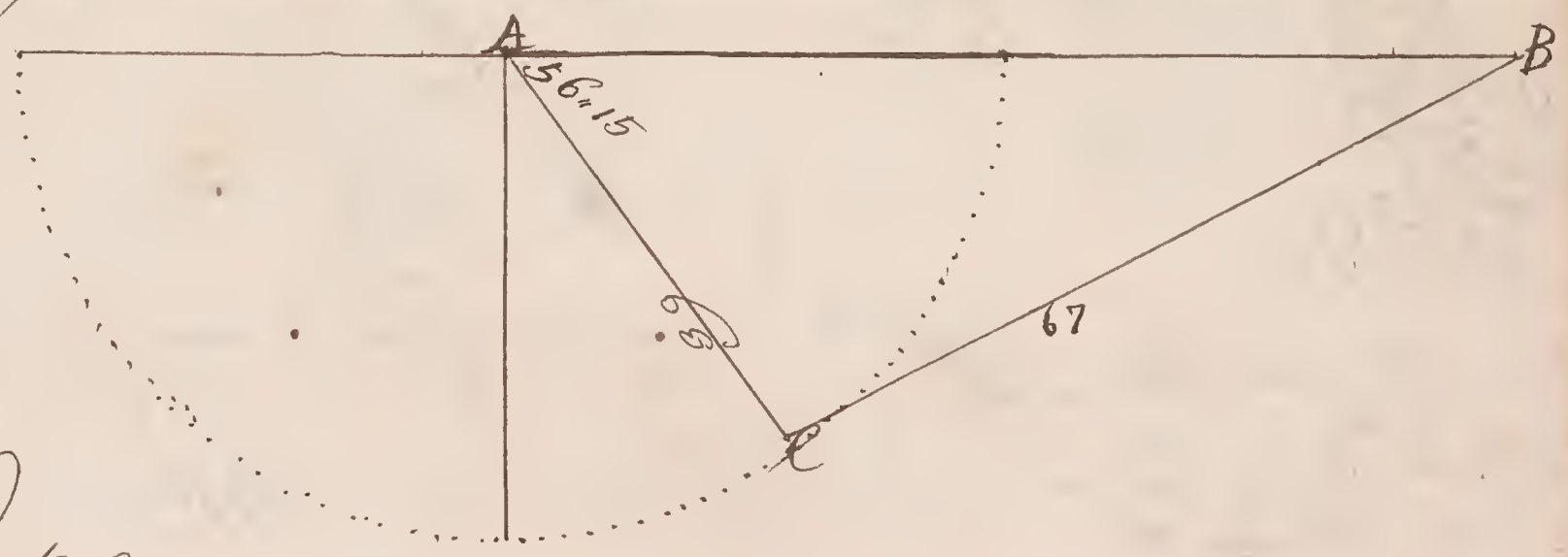


As the Sum of the other 2 Sides		272	2.434567
Is to their x		68	1.944863
So is the ½ the Sum of its unknown angles		73° 07	10.547833
		46° 50	12.462316
To the ½ the x	L C	119° 57	10.027757
	L A	26° 17	

As Sine L A		26° 17	9.646218
Is to Side B C		92	1.963786
So is Sine L B		33° 45	9.744739
			11.708527
To Side A C		115.4	2.062309

Answer her Course is S S W ½ W Distance 115.4 miles

Suppose a Merchant Ship in the Latt 45° 30' N falls into the Hands of Pirates, who take away his Sea Compass; after which he Sails as Directly as he can 67 Leags between the South and West; and at the end of two days meets a Ship of War who also had been the day before in the Latt 45° 30' N and had Sailed thence S E B S 39 Leagues now the Merchant Ship left those Pirates to and fro where they robb'd him: and the man of War being desirous to speak with those Pirates, Demand what Course he must shape to meet them.



As Side B C ---------- 67 ---------- 1.8 2 6 0 7 5
As to Angle L A ---------- 56° 15 ---------- 9.9 1 9 8 4 6
As Side A C ---------- 39 ---------- 1.5 9 1 0 6 5
As Side L B ---------- 28° 14 ---------- 11.5 10 9 11
9.6 7 4 8 3 6
9 0° 00
61° 46

Answer her Course is N 61° 46' E

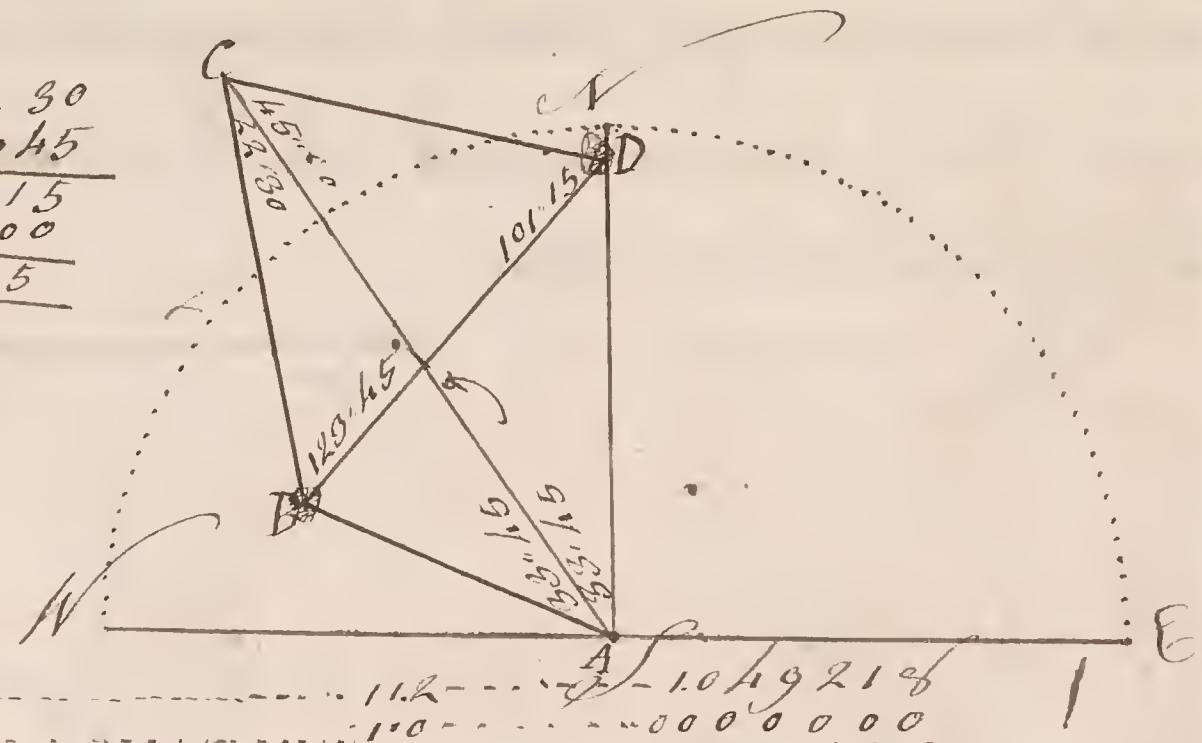
Coasting along Shoar I saw two Capes of Land; The first did bear North the Second did Bear N.N.W then I stood I way N.W.b.N. 9 miles untill the first did Bear from me E.b.S and the Second S.b.E the Bearing & Distance of them is required

5.1
6.1
11.2
1.0 Sum 2 Sides

45°,00
33°,45
78°,45
180°,00
LD 101°,15

22 30
33°,45
56°,15
180°,00
LB 123°,45

45°,00
22°,30
67°,30
180°,00
112°,30
56°,15
06°,32
64°,47 LD
47°,43 LB



As the Sum of the 2 Sides ---------- 11.2 ---- 1.049216
So is their x ---------- 1.0 ---- 0.000000
So is the S of ½ the Sum of the unknown angles ---------- 56°,15 ---- 9.919646
To the S of ½ their x ---------- 64°,16 ---- 9.957062

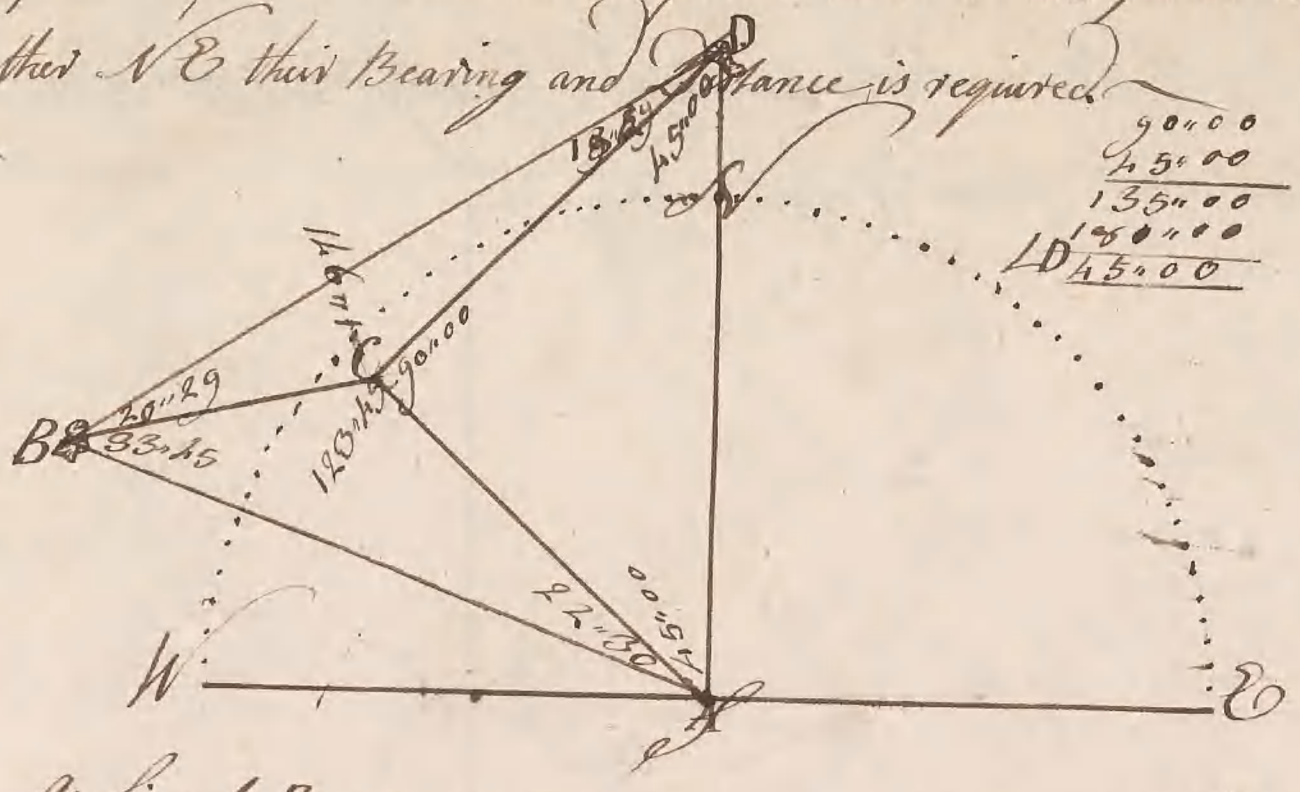
As Sine
As Sine LD ---------- 78°,45 ---- 9.991474
To Side AC ---------- 9 ---- 0.954242
So is Sine LA ---------- 33°,45 ---- 9.744739
To Side CD ---------- 5.1 ---- 10.690455
0.707507

As Sine
As Sine LB ---------- 56°,15 ---- 9.919646
To Side AC ---------- 9 ---- 0.954242
So is Sine LA ---------- 33°,45 ---- 9.744739
To Side BC ---------- 6.1 ---- 10.698461
0.777135

As Sine LB ---------- 47°,43 ---- 9.869130
To Side CD ---------- 5.1 ---- 0.707507
So is Sine LC ---------- 67°,30 ---- 9.965615
To Side BD ---------- 6.4 ---- 10.673122
0.803992

Answer the headlands Boat from each other N.E.b.N½E and S.W.b.S½W Dist 6.4 miles

Suppose a Ship sailing N by W two Islands appear in sight one Bears N by W the other N of the Ship; and when the Ship had sailed 6 miles farther the first Bears N by E and the other N E their Bearing and Distance is required.



90°00
45°00
135°00
180°00
∠D 45°00

56°15
112°30
11°15
123°45
22°30
146°15
180°00
∠ 33°45 B

146°01
180°00
2)33°59
16°59
03°30
20°29
13°29

6
4
10
2

As Sine ∠B ---------- 33°45 ---- 9.744739
To Side AC ---------- 6 ---- 0.778151
So is Sine ∠A ---------- 22°30 ---- 9.582640
To Side BC ---------- 4 ---- 10.360991
0.616152

As Sine ∠D ---------- 45°00 ---- 9.849485
To Side AC ---------- 6 ---- 0.778151
So is Sine ∠A ---------- 45°00 ---- 9.849485
To Side DC 10.627636
0.778151

As the Sum of the 2 Sides ---------- 10 ---- 1.000000
To their x ---------- 2 ---- 0.301030
So is the ½ of the Sum of the unknown angles ---- 16°59 ---- 9.465935
To the ½ of the x ---------- 0°3°30 ---- 8.766965

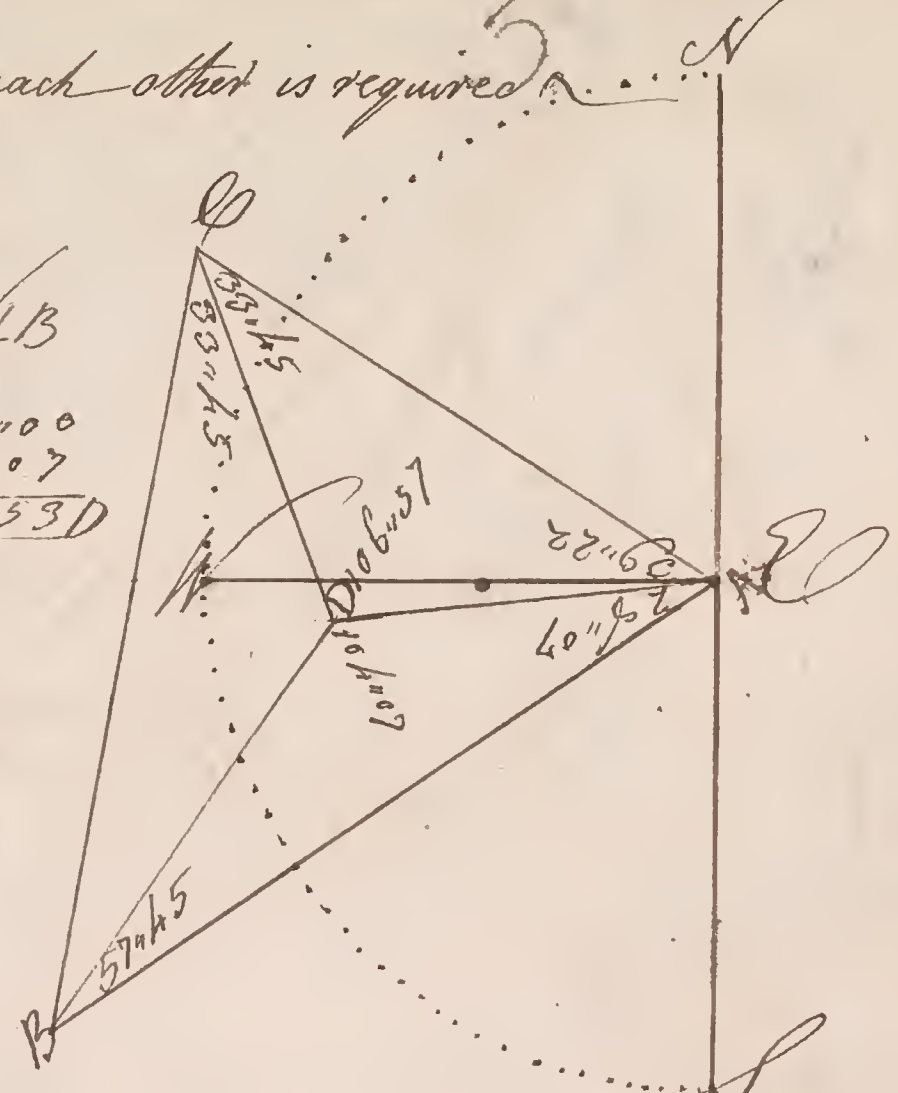
As Sine ∠D ---------- 13°29 ---- 9.367659
To Side BC ---------- 4 ---- 0.616152
So is Sine ∠A ---------- 33°45 ---- 9.744739
To Side BC 10.360791
0.992891

The Bearing of the two Islands is N E ½ E & S W ½ W Dist 9.6 miles

Three Ships sailed from one Port the first Sails SWBW the Second WBS½W and the Third NWBW 6 miles Then the first Bears from the Third SBW the Second Bears from the third SS½E The first and Second Ships Distance sailed, and their Bearing and Distance from each other is required

39°22 DAC
33°45 DCA
73°07
180°00
106°53 ADC

67°30
67°29
134°59
180°00
45°01 WLB



29°07
45°01
73°08
36°04

29°07
180°00
151°53
75°56

180°00
104°07
175°53 D

11
4.6
15.6
7.6

½ 29°07
14°03

29°11
75°56
104°07
47°45

as Sine ∠D ——— 73°07 ——— 9.98066
To Side AC ——— ——— 0.90309
So is Sine ∠C ——— 33°45 ——— 9.74473
To Side AD ——— 4.6 ——— 10.64729
0.66963

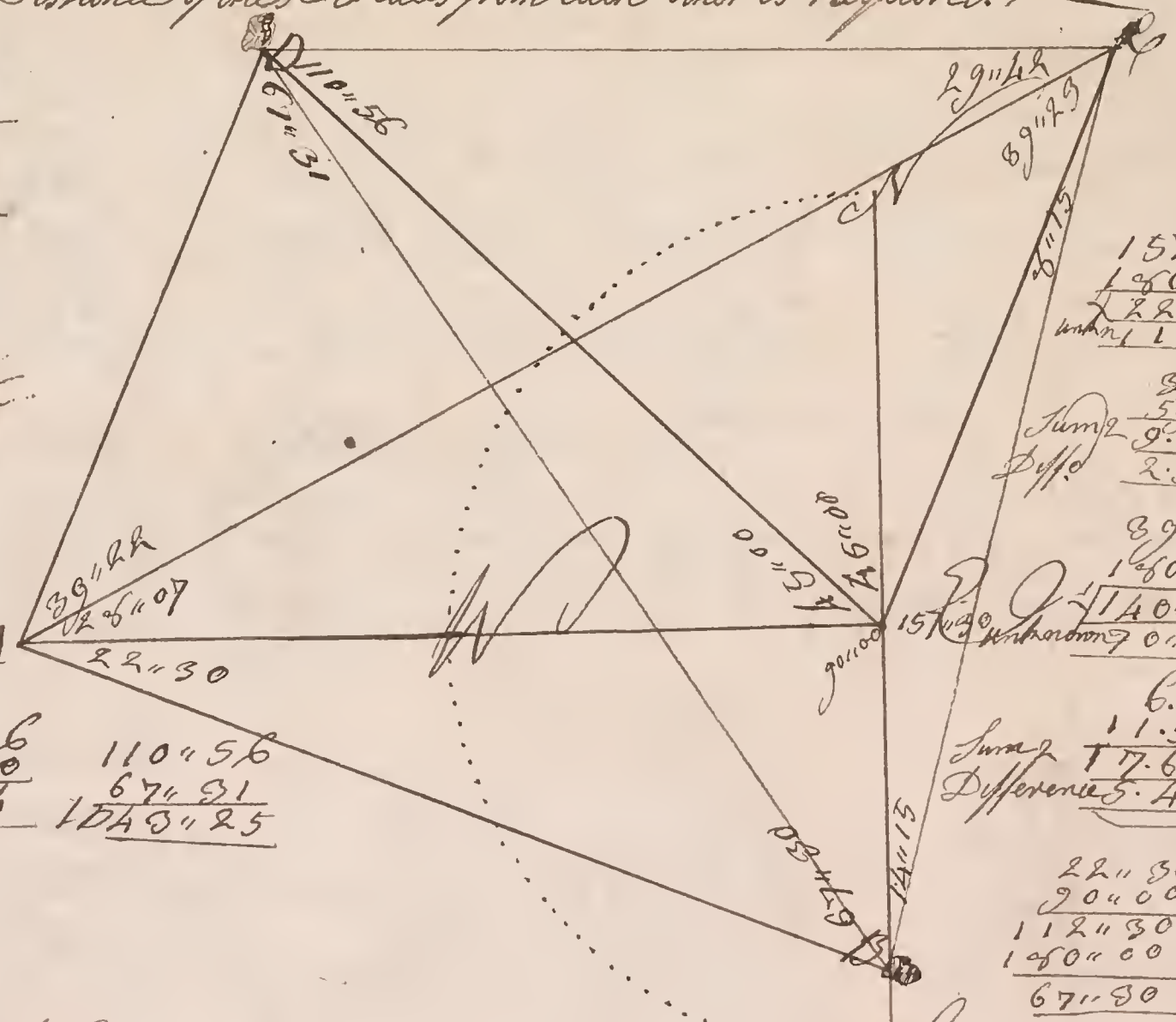
as Sine ∠B ——— 45°01 ——— 9.84961
To Side AC ——— ——— 0.90309
So is Sine ∠C ——— 67°30 ——— 9.96561
To Side AB ——— 10.5 ——— 10.86705
1.01909

as the Sum of the 2 Sides ——— 15.6 ——— 1.19312
To the ∝ ——— 7.6 ——— 0.88081
So is the ½ of the Sum of the unknown angles ——— 75°56 ——— 9.98658
10.86740
To the ½ of the ∝ ——— 29°11 ——— 9.67426

as Sine ∠D ——— 75°53 ——— 9.98663
To Side AB ——— 11 ——— 1.01909
So is Sine ∠A ——— 29°07 ——— 9.67326
To Side DC ——— 5.1 ——— 10.69236
0.70567

Answer the first ships Distance 10.5 Miles Second ships Distance is 4.6 Miles the Bearing between the two ships one from the other is SWBS½S and NEBN½E Distance 5.1 miles

Admit Sailing along Shore I see two Headlands the Eastermost Bears N.N.E and the Westermost N.W from me at the same time an Island Bear South then after I sailed West 6 miles the first did Bear N.E.b.E.½E the Second N.N.E and the Island S.S.E from one the Bearing and Distance of these Places from each other is Required.



90° 00
22° 30
∠BAC 28° 07
140° 37
180° 00
∠BCA 39° 23

90° 00
22° 30
∠ABC 67° 30

180° 00
22° 30
∠C 157° 30

28° 07
45° 00
112° 07
180° 00
∠D 67° 31

110° 56
180° 00
∠D 69° 04

110° 56
67° 31
∠DAC 43° 25

39° 23
89° 42
28° 15
∠C 77° 20

157° 30
180° 00
22° 30
Remains 1° 1.5 Sounds

Sum 2 5.9
Diff 9.3 Sides
2.5

89° 22
180° 00
140° 36
Remains 70° 56 Sounds

Sum 6.1
Diff 1.5
Sum 7.6 Sides
Difference 5.4

22° 30
90° 00
112° 30
180° 00
67° 30

As Side ∠C — 89° 23 — 9.602485
To Side AB — 8 — 0.903090
So is ∠C — 67° 30 — 9.965615
10.868705
To Side AC — 11.5 — 1.066270

As Side ∠C — 89° 23 — 9.602485
To Side AC — 8 — 0.903090
So is ∠A — 28° 07 — 9.673268
10.576258
To Side CC — 5.9 — 0.773923

As Side ∠B — 67° 30 — 9.965615
To Side AC — 8 — 0.903090
So is ∠A — 22° 30 — 9.582840
10.485930
To Side BC — 8.4 — 0.520815

As Side ∠D — 67° 31 — 9.965668
To Side AC — 8 — 0.903090
So is ∠C — 45° 00 — 9.849445
10.752535
To Side AD — 6.1 — 0.786907

As the Sum of the 2 Sides - - - - - - - - - - - 9.3 - - - - - 0.9664463
To the ∝ - 2.5 - - - 0.3979400
So is the ½ of the Sum of the unknowns - - - - 11° 15 - - - 9.2990296
To the ½ of the ∝ - - - - - - - - - - - - - - - 23°00 - - - 9.6634176
4°15 - - - 9.7119693
11°15

As Sine of B - - - - - - - - - - - - 11°15 - - - - 9.3912086
To Side C C - - - - - - - - - - - - - 5.9 - - - - 0.7739246
So is Sine ∠ C - - - - - - - - - - - - 22°30 - - - - 9.5826840
To Side B C - - - - - - - - - - - - - - 9.2 - - - - 10.356766
0.9655560

As the Sum of the 2 Sides - - - - - - - 17.6 - - - - 1.245513
To their ∝ - - - - - - - - - - - - - - - - 5.4 - - - 0.7320094
So is the ½ of the Sum of the unknowns - - 70°19 - 10.046452
11.177846
To the ½ of the ∝ - - - - - - - - - - - - - 40°37 - 9.9999999
110°56
29°42

As Sine of D - - - - - - - - - - - - 69°04 - - - - 9.9703345
To Side A C - - - - - - - - - - - - - 11.5 - - - - 1.0606275
So is Sine ∠ A - - - - - - - - - - - 39°22 - - - 9.8022062
10.862557
To Side D C - - - - - - - - - - - - - 7.9 - - - 0.8981212

As Sine ½ D - - - - - - - - - - 18°25 - - 9.8497146
To Side B C - - - - - - - - - - 9.2 - - - - 0.9637880
So is Sine ∠ C - - - - - - - - 77°20 - - - 9.9869299
10.8537087
To Side B D - - - - - - - 18.5 - - - - 1.0159941

Answer the Island Bears from the Eastermoast Cape N.B E ¼ E Distance 9.2 miles and from the Westermost Cape N.N.W ¼ W Distance 10.5 miles the Bearing of the two Capes from each other W B N ¼ W and E B S ¼ E Distance 7.9 miles

A Fleet of Ships with four men of War with the Wind at W by S sails away S E 3 miles an Hour till Hearing of some Pirates to Northward of them the Commadore sends out a man of War a Cruising who sails due North 7 miles an hour for the space of a 11 hours; and finding the Pirate (after an Hours Conflict) took him; the fleet all the while Sailing S E 3 miles an hour. Now I demand what Course the man of War and the Pirate must sail that they may just fall in with the fleet without altering their Course; Supposing they sail

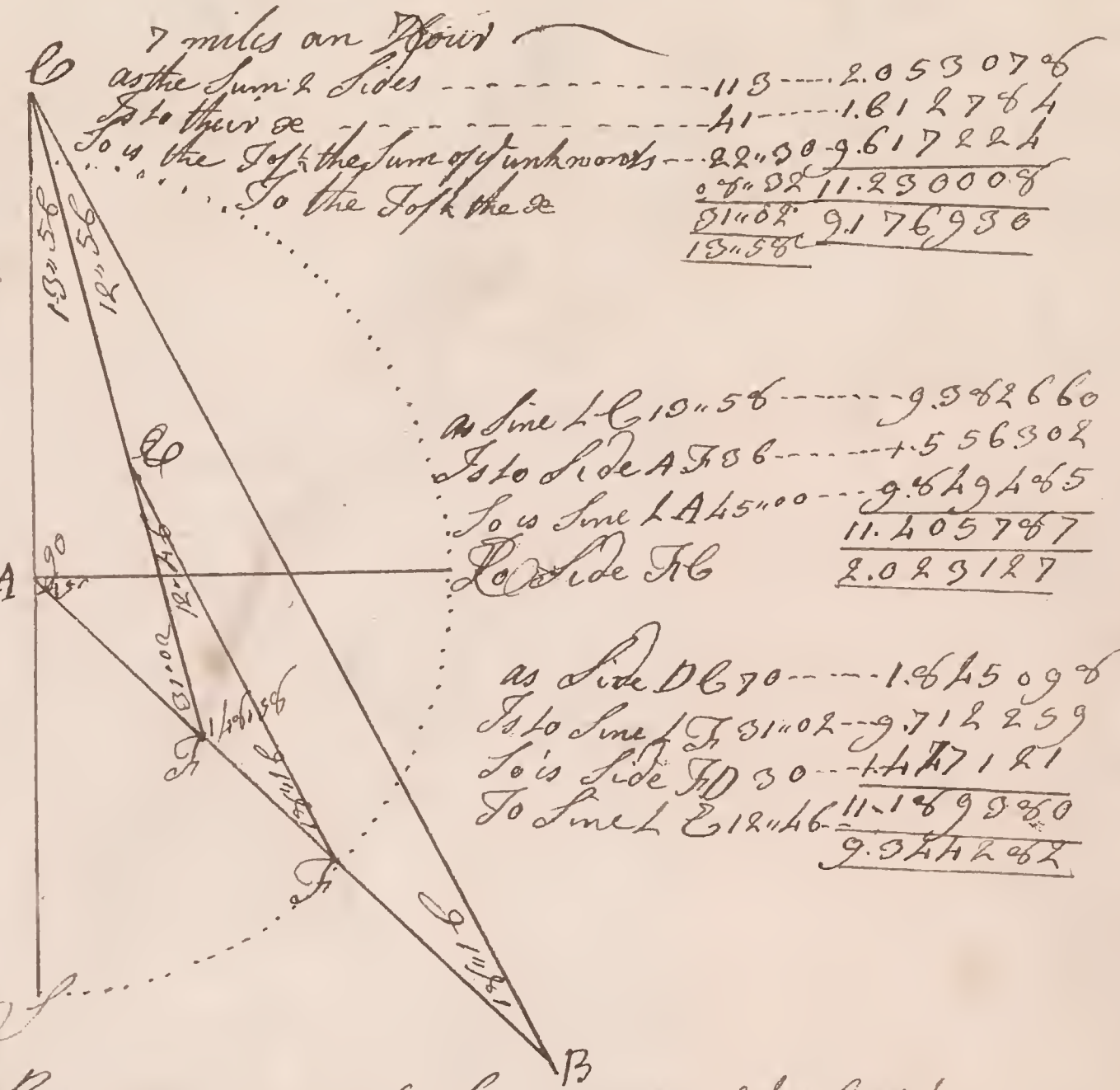
45 ° 00
90 ° 00
135 ° 00
160 ° 00
145 ° 00
22 ° 30

36
77
113
41

160 ° 00
91 ° 02
LH 146 ° 58

12 ° 46
146 ° 56
161 ° 42
160 ° 0 0
LB 18 ° 16

12 ° 46
13 ° 56
26 ° 42



as the Sum 2 Sides ---------- 113 ---- 2.053076
Is to their Ex ---------- 41 ---- 1.612784
So is the Sof ½ the Sum of 3 unknowns --- 22 ° 30 - 9.617224
So is the Sof ½ the Ex ° ′ ″ 02 11.250008
91 ° 02 9.176930
13 ° 58

as Sine ∠ C 13 ° 56 ---------- 9.382660
Is to Side A B 86 ---------- + .556302
So is Sine ∠ A 45 ° 00 --- 9.649465
To Side H C 11.405767
2.023127

as Side D C 70 ---------- 1.845098
Is to Sine ∠ F 91 ° 02 -- 9.712259
So is Side F D 30 ---------- 1.471221
To Sine ∠ E 12 ° 46 = 11.184960
9.954262

as Sine ∠ B ---------- 16 ° 16 ---------- 9.496154
Is to Side F C ---------- 105.5 ---------- 2.023127
So is Sine ∠ A ---------- 91 ° 02 ---------- 9.712259
11.735386
To Side B C ---------- 173.5 ---------- 2.239232

answer the man of War and Pirate must steer S S E ½ E

H m
24 ° 47 to join the fleet

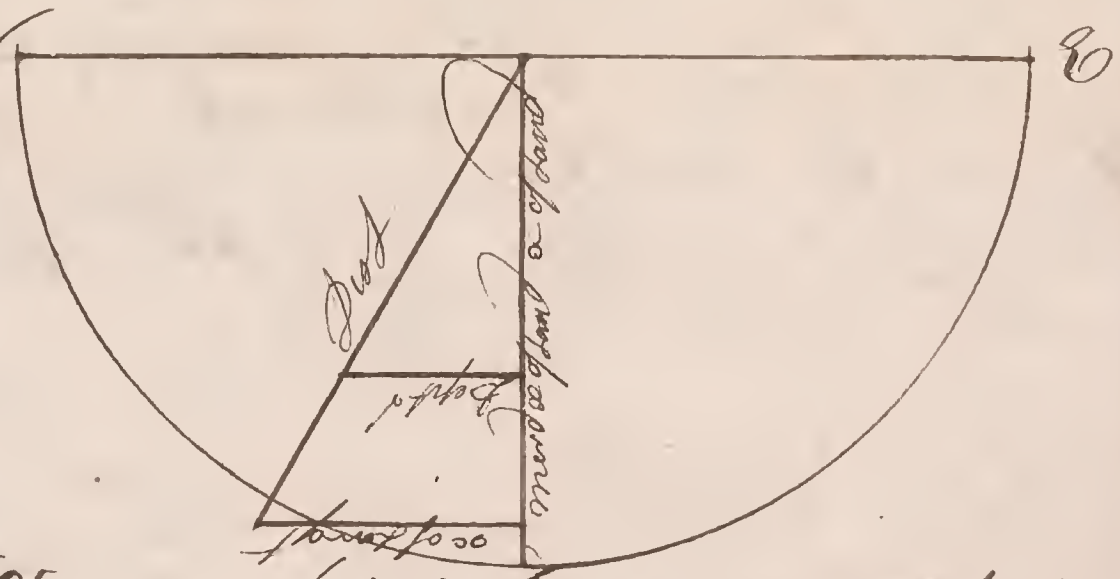
Coasting along shore I set two Headlands one Bears N BW and the other N E B E and a Bouy Bears N E B N at the same time I saw two Islands; the one Bears S S W 3/4 W and the other E S E and a Rock S E then I Sailed East 100 miles and the first Headland Bore N W B W the Second N 1/2 E and the Bouy N W 1/2 W then the first Island Bears W S W and the other Island S B E 3/4 E and the Rock S W B W I demand their Bearing and Distance from each other

Mercator's Sailing 1759

as the Degrees of Longitude Continually Decrease in going from the Equator towards either Pole it is the Busines of Mercator's Sailing every where to adjust the Degrees of Latitude to the Degrees of Longitude by a Table of Meridional parts

I demand what Course Departure & Distance a Ship makes in Sailing from the Start Point to Cape Finisterre

Start point Lat 50°07.N 3465 M
Cape Finist Lat 43°12.N 2660
6755 605
x of Lat 60
415



As Merid x of Lat ---- 605 ---- 2.781755
Is to Radius ---- 90°00 ---- 10
So is the x of Long ---- 353 ---- 2.547775
To the I Course ---- 30°16 ---- 2.766020
CC 59¼4

Start point Long 03°47 W
Cape Finist Long 09°40 W
653
x of Longitude 60
353 W

As S C Course ---- 59°44 ---- 9.986857
Is to the x of Lat ---- 415 ---- 2.618046
So is Radius ---- 90°00 ---- 10
To the Distance ---- 480.5 ---- 2.681691

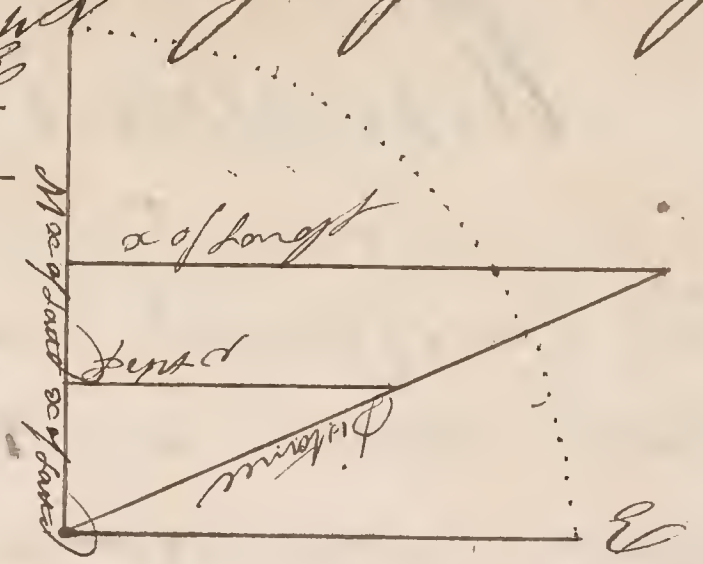
As Radius ---- 90°00 ---- 10
Is to the Distance ---- 480.5 ---- 2.681691
So is S Course ---- 30°16 ---- 9.760252
To the Departure ---- 242.2 ---- 2.381443

Ans[d] her Course is SSW½W Departure 242.2 miles Distance 480.6 miles

I demand what Course Departure & Distance a Ship makes in Sailing from Whitby to Gottenburgh

Whitby Latt 54°30 N 3916 Whitby Long 00°50 W
Gottenburgh Latt 57°50 N 4275 Gottenburgh Long 12°15 E
3°20 | 359 13°05
60
200

60
1965



as Mac of Latt	359	2555094
So to Radius	90°00	10
So is the ac of Longt	785	2894670
So the I Course	65°25	10339776

I S E
SE 24°35

as SE Course	24°35	9619110
So to the ac of Latt	200	2301030
So is Radius	90°00	10
So the Distance	460.6	2.661920

as Radius	90°00	10
So to the Distance	460.6	2661920
So S Course	65°25	9958794
So the Departure	437.2	2640654

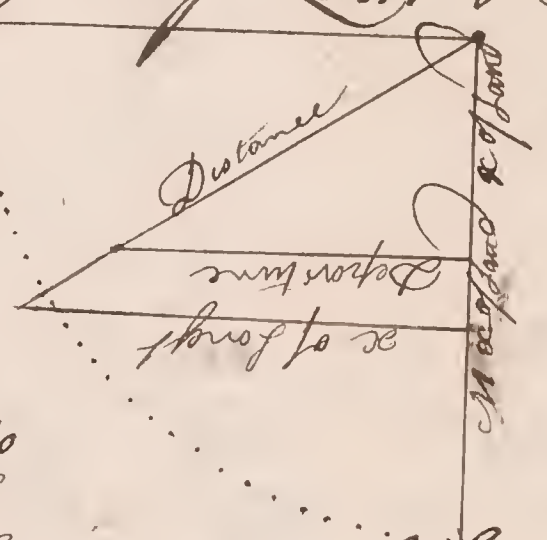
Another Course is N 25 3/4 E
Departure 437.2 miles
Distance 460.6 miles

A Ship from Oporto sails SW by W 826 Miles. I demand her Departure with y Latt & Longt in

Oporto Latt 41°10. N 2711
ac of Latt 07°39 | 2186
Latt in 33°31 | 579

Oporto Longt 09°25 W
ac of Longt 14°26 W
Longt in 23°51 W

90°00
SE 56°15
33°45



as Radius	90°00	10
So to the Distance	826	2.916980
So is S Course	56°15	9.919846
So the Departure	686.6	2.836826

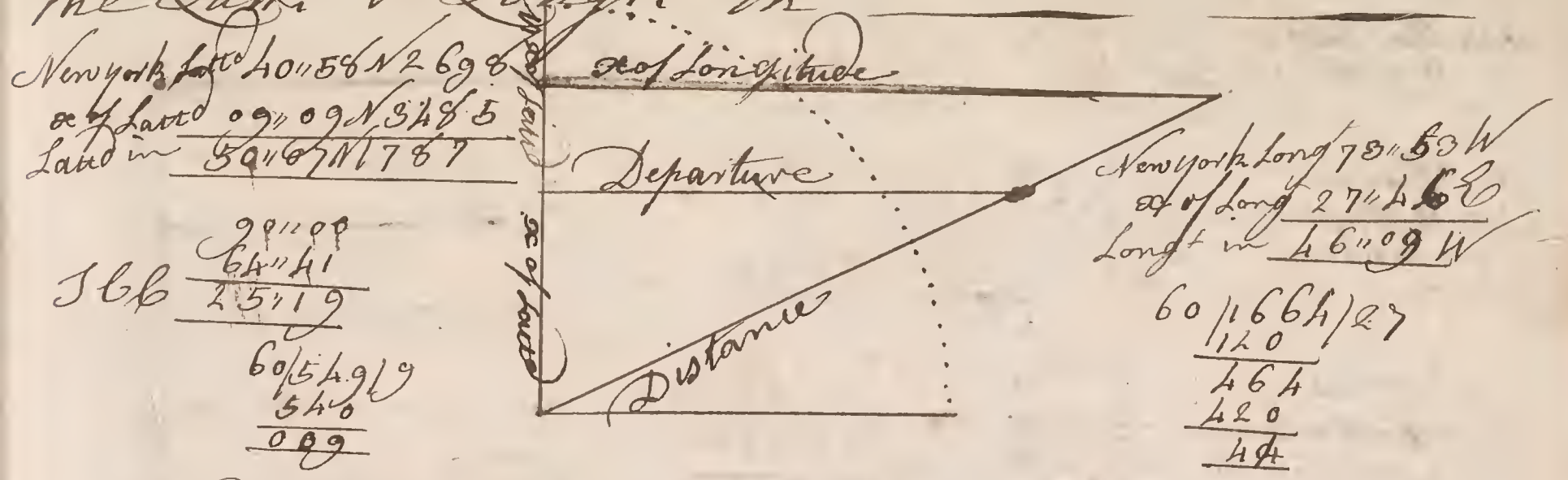
as Radius	90°00	10
So to the Distance	826	2.916980
So is SE Course	33°45	9.744739
So the ac of Latt	459	2.661719

as Radius	90°00	10
So to M ac of Latt	579	2.762679
So is I Course	56°15	10.174834
So the ac of Longt	866	2.937513

60 | 459 |
420
39

60 | 866 | 14
60
266
246
26

A Ship from New York Sails NE b E $\frac{3}{4}$ E. 128 4/ Miles I demand her Departure with the Latt. & Long.t. in



New York Lat.d 40°58 N 2696
ex.s of Latt.d 09°09 N 548.5
Latt.d in 50°07 N 1787

New York Long.t 73°53 W
ex.s of Long.t 27°46 E
Long.t in 46°09 W

90°00
64°41
25°19

60 | 549.9
540
009

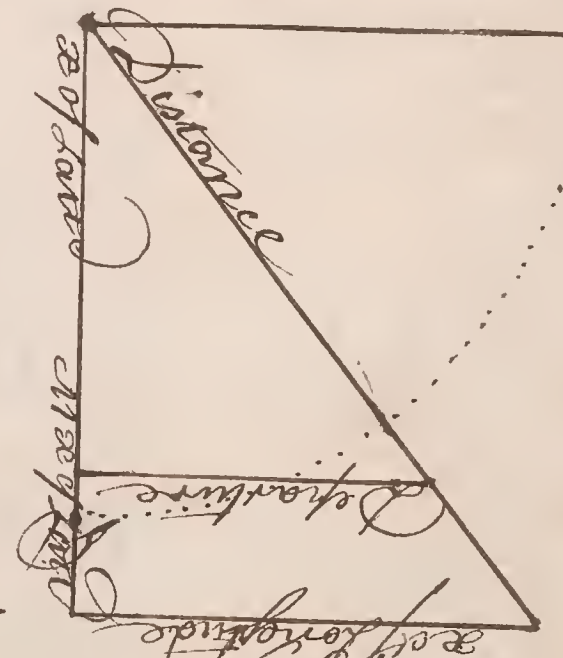
60 | 1664 | 27
120
464
420
44

as Radius ---------- 90°00 ---------- 10
To to the Distance ---------- 1284 ---------- 3.108565
To is S Course ---------- 64°41 ---------- 9.956346
To the Departure ---------- 1161 ---------- 3.064713

as Radius ---------- 90°00 ---------- 10
To to the Distance ---------- 1284 ---------- 3.108565
To is S & Course ---------- 25°19 ---------- 9.631059
To the ex of Latt.d ---------- 549.1 ---------- 2.739624

as Radius ---------- 90°00 ---------- 10
To to merid ex of Latt.d ---------- 787 ---------- 2.895975
To is I Course ---------- 64°41 ---------- 10.325090
To the ex of Long.t ---------- 1664 ---------- 3.221065

A Ship from Louisburgh Sails SE b S $\frac{1}{4}$ S till her Departure be 684 Miles I demand her Distance with the Latt.d & Long.t in



90°00
36°34
53°26 S E

as S Course ---------- 36°34 ---------- 9.775070
To to the Departure ---------- 684 ---------- 2.835056
To is Radius ---------- 90°00 ---------- 10
To the Distance ---------- 1146 ---------- 3.059986

as Radius ---------- 90°00 ---------- 10
To to the Distance ---------- 1146 ---------- 3.059986
To is S & Course ---------- 53°26 ---------- 9.904804
To the ex of Latt.d ---------- 922.1 ---------- 2.964790

as Radius ---------- 90°00 ---------- 10
To to merid ex of Latt.d ---------- 1164 ---------- 3.073352
To is the I Course ---------- 36°34 ---------- 9.870265
To the ex of Long.t ---------- 876.3 ---------- 2.943617

Louisburgh Latt.d 46°00 N 2116
ex of Latt.d 15°22 S 1922
Latt.d in 30°36 N 194

Louisburgh Long.t 58°30 W
ex of Long.t 14°39 E
Long.t in 43°51 W

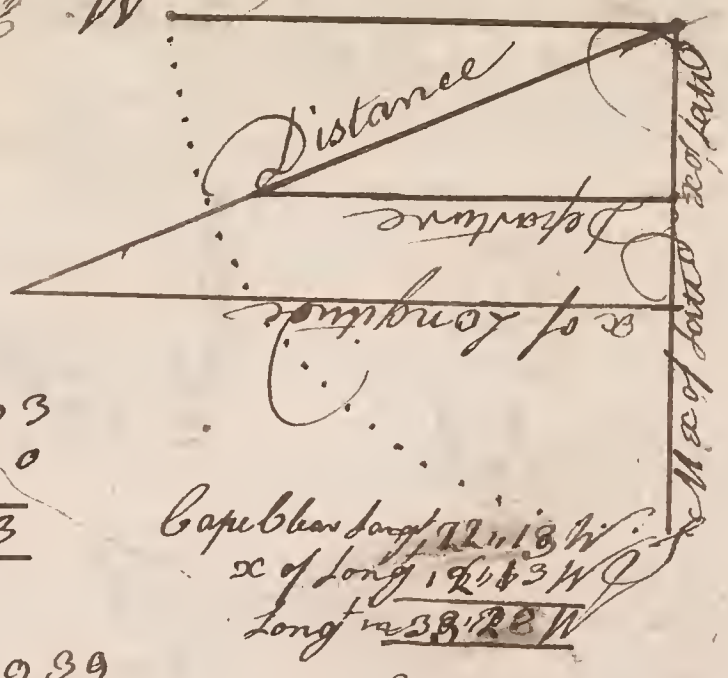
60 | 876.3 | 14
60
276
240
36

60 | 922.15
60
322
300
22

A Ship from Cape Clear Sails W N W till her Departure be 875 Miles I demand her Distance with the Latitude and Longitude in

Cape Clear Latt 51°57 N 3660
Ex. of Latt 06°02 391 06
Lard in 45°55 N 352

90°00
67°30
22°30 SE W



as S Course ---- 67°30 ---- 9.966615
Is to the Departure --- 875 ---- 2.942006
So is Radius ---- 90°00 ---- 10
Is the Distance --- 947.1 ---- 2.976393

as Radius ---- 90°00 ---- 10
Is to the Distance --- 947.1 ---- 2.976393
So is S E Course --- 22°30 ---- 2.582840
Is the Ex of Latt ---- 362.5 ---- 2.559233

Cape Clear Long 22°18 W
Ex of Long 12°43 W
Long in 38°28 W

as Radius ---- 90°00 ---- 10
Is to Mid Ex of Latt --- 552 ---- 2.741939
So is the I Course --- 67°30 ---- 10.382776
Is the Ex of Long --- 853 ---- 3.124715

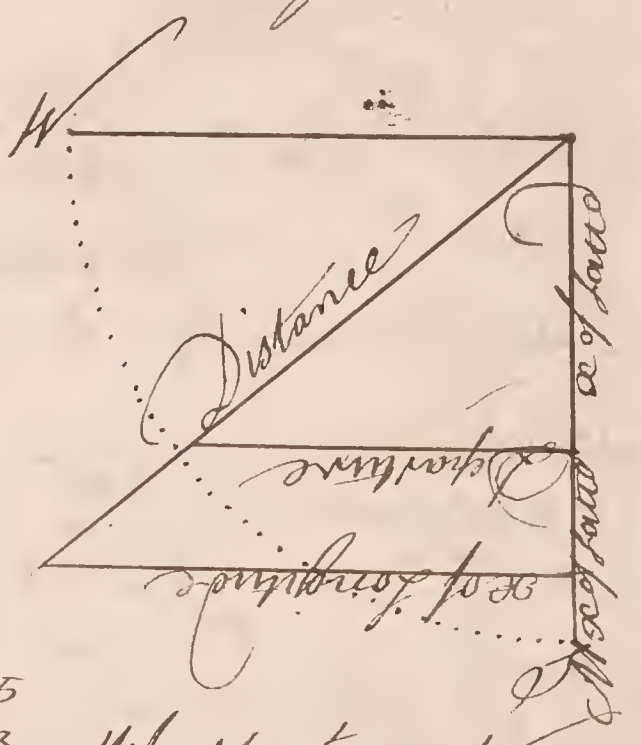
60/1385/12
120
133
120
13

60/3621
360
2

A Ship from Ushant Sails W ½ W till she arrive in Latd 38°20 North I demand her Departure Distance and Longd in

Ushant Latt 46°30 S 3637
Latt in 38°20 N 2494
10°10' 643
60
610

90°00
50°37
39°23 SE E



as S E Course ---- 39°23 ---- 9.802485
Is to the Ex of Latt ---- 610 ---- 2.785330
So is Radius ---- 90°00 ---- 10
Is the Distance ---- 961.3 ---- 2.982695

as Radius ---- 90°00 ---- 10
Is to the Distance ---- 961.3 ---- 2.982695
So is S Course ---- 50°37 ---- 9.886133
Is the Departure ---- 743.1 ---- 2.868828

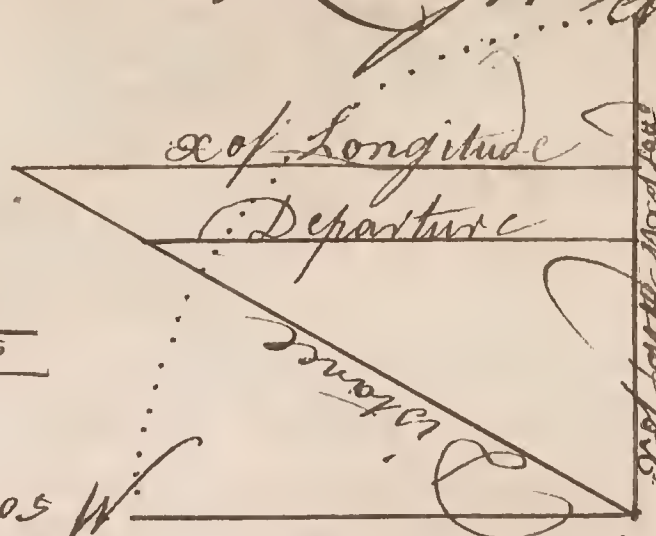
Ushant Long 5°02 W
Ex of Long 17°07 W
Long in 22°09 W

60/1027/17
60
427
420
7

A Ship from Cape Trafalgar Sails NW b W ½ W
till she is by Observation in Latd 42° 10 North
I demand her Departure Distance & Longd in

Cape Trafalgar Latd 36°10 N 2350
Latd in 42°10 N 2795
6°00 | 465
60
360

90°00
59°04
30°56 566



as SW Course ..... 30°56 ..... 9.710997
Is to the x of Latd ..... 360 ..... 2.556307
So is Radius ..... 90°00 10
2.845305
To the Distance 700.4

as Radius ..... 90°00 10
Is to the Distance ..... 700.4 ..... 2.845305
So is S Course ..... 59°04 ..... 9.933369
To the Departure ..... 600.7 ..... 2.778674

as Radius ..... 90°00 10
Is to the x of Latd ..... 465 ..... 2.667453
So is the S Course ..... 59°04 ..... 10.222372
To the x of Longt ..... 776 ..... 2.889825

Cape Trafalgar Long 6°10 W
x Longt in 12°56 W
Long in 19°06 W

60 | 776 | 12
60
176
12 8
56

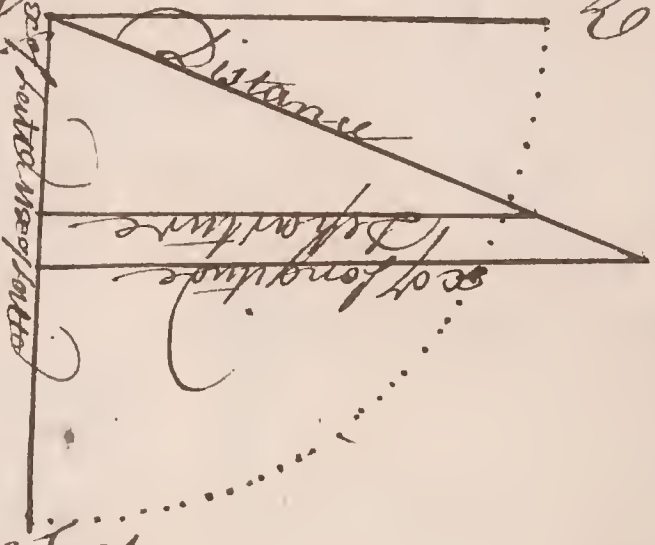
A Ship from Cape Cod Sails ESE till she arrive in
Longt 30°25 West—I demand her Departure
Distance and Latitude in

Cape Cod Latd 42°12 N 279 6
Latd in 29°20 S 957
12°55 | 1641

Cape Cod Long 66°55 W
Long in 30°25 W
36°30 W
60
2310

x of Latd 60
772
90°00
67°30
SC 22°30

x of Long 60
2310



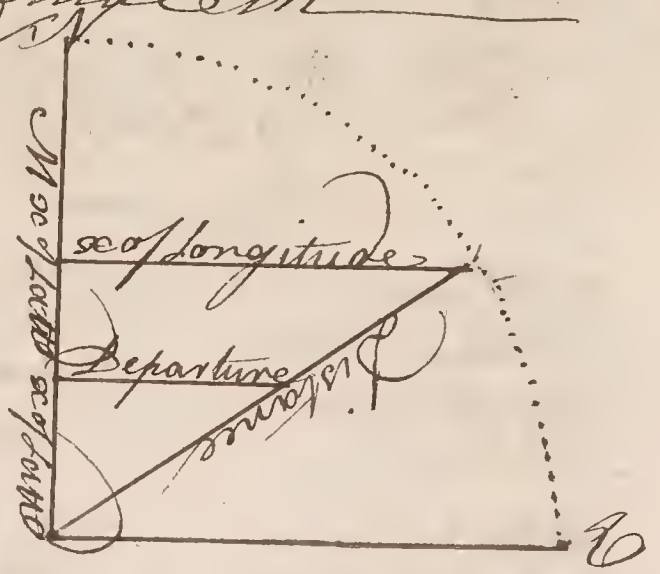
as S Course ..... 67°30 ..... 9.965615
Is to the x of Longt ..... 2310 ..... 3.363612
So is SC Course ..... 22°30 ..... 9.582640
12.946452
To the Mer of Latd ..... 957 ..... 2.960637

as SC Course ..... 22°30 ..... 9.582640
Is to the x of Latd ..... 772 ..... 2.887617
So is S Course ..... 67°30 ..... 9.965615
12.853232
To the Departure ..... 1664 ..... 3.270392

as S Course ..... 67°30 ..... 9.965615
Is to the Departure ..... 1664 ..... 3.270392
So is Radius ..... 90°00 10
To the Distance ..... 2017 ..... 3.304777

A Ship from Whitby Sails NE ¾ E till she arrive in Lat. 57°, 22 East I demand her Departure Distance and Latitude in

Whitby Lat. 54°, 30 N 916 Whitby Long 00°, 50 W
Lat in 57°, 53 N 365 Long in 07°, 22 E
3°, 23 | 4261 7°, 12
60 60
Dif of Lat 203 Dif of Long 492
90°, 00
53°, 26
36°, 34



as S Course ---- 53°, 26 ---- 9.901860
Is to the Dif of Long ---- 492 ---- 2.691965
So is S C Course ---- 36°, 34 ---- 9.775070
To the Mer of Lat ---- 365 ---- 2.562231

as S C Course ---- 36°, 34 ---- 9.775070
Is to the Dif of Lat ---- 203 ---- 2.307496
So is S Course ---- 53°, 26 ---- 9.901860
To the Departure ---- 273.6 ---- 12.212300
2.437230

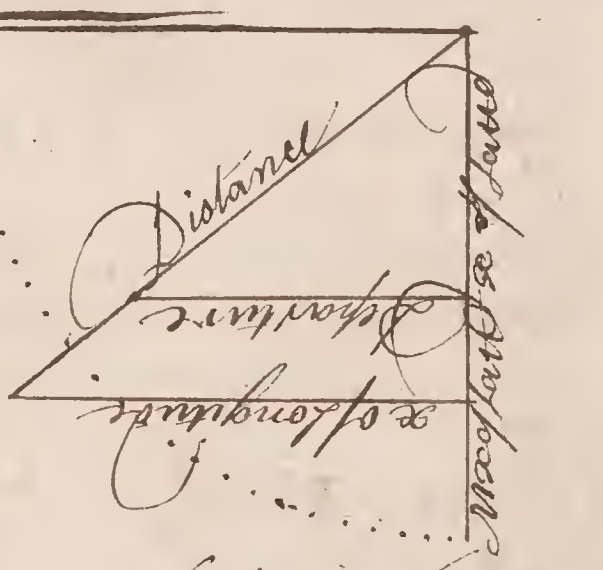
as S Course ---- 53°, 26 ---- 9.901860
Is to the Departure ---- 273.6 ---- 2.437230
So is Radius ---- 90°, 00 ---- 10
To the Distance ---- 340.6 ---- 2.532422

Ans. her Lat. in 57°, 53 N Departure is 273.6 miles Distance 340.6 miles

---

A Ship from Ushant Sails 848 Miles between the South & the East when her Departure is 672 Miles I demand her Course with the Lat. and Long. in

Ushant Lat 48°, 30 N 3337 Ushant Long 05°, 20 W
Dif of Lat 6°, 37 52613 Dif of Long 1°, 51, 41 W
Lat in 39°, 53 | 724 Long in 21°, 01 W
90°, 00
52°, 25
37°, 35 S C



as the Distance ---- 846 ---- 2.926396
Is to Radius ---- 90°, 00 ---- 10
So is the Departure ---- 672 ---- 2.827369
To the S Course ---- 52°, 25 ---- 9.900973

as Radius ---- 90°, 00 ---- 10
Is to the Distance ---- 846 ---- 2.926396
So is S C Course ---- 37°, 35 ---- 9.785269
To the Dif of Lat ---- 5172 ---- 2.711665

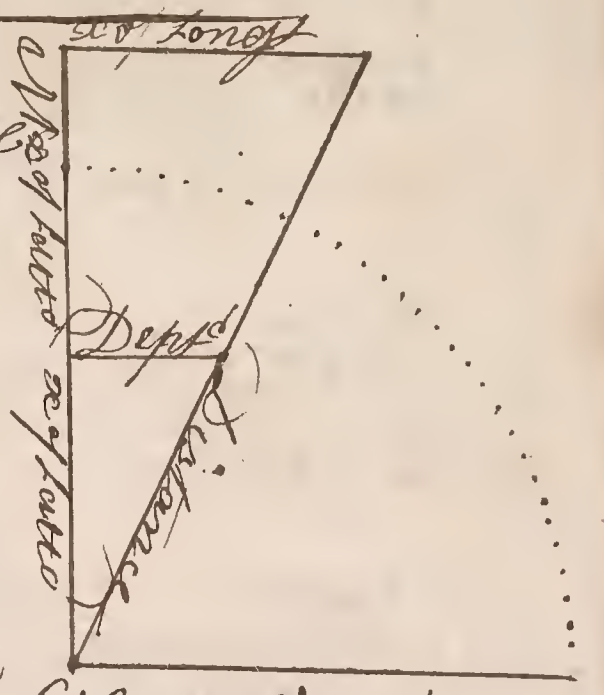
60 | 517 | 6
480
37

as S C Course ---- 37°, 35 ---- 9.785269
Is to Mer of Lat ---- 724 ---- 2.859759
So is S Course ---- 52°, 25 ---- 9.996951
To the Dif of Long ---- 920.7 ---- 12.756720
2.973451

60 | 941 | 15
60
341
300
41

a Ship from Whitby Sails 684 Miles between the North & the East when her Departure is 300 Miles I demand her Course with the Latitude and Longitude in

Whitby Lat 54°30' S 5916 Whitby Long 0°50' W 90°00
Lat of Land 10°15' N 6143 Lat of Long 09°59 E 26°01
Land in 64°45 | 1227 Long in 9°09 E 63°59 E



as the Distance ---------- 684 ---------- 2.835056
Is to Radius ---------- 90°00 ---------- 10
So is the Departure ---------- 300 ---------- 2.477121
To the SE Course ---------- 26°1 ---------- 9.642066

as Radius ---------- 90°00 ---------- 10
Is to the Distance ---------- 684 ---------- 2.835056
So is SE Course ---------- 63°59 ---------- 9.953598
To the Lat of Land ---------- 614.7 ---------- 2.788654

as SE Course ---------- 63°59 ---------- 9.953598
Is to Mer of Land ---------- 1227 ---------- 3.088645
So is S Course ---------- 26°01 ---------- 9.642101
To the Lat of Long ---------- 599 ---------- 12.730946
277754.6

60/615/1060/599/9
60 / 15
540 / 59

A Ship from the Capes of Virginia Sails 648 Miles between the North & the East when she is by Observation in Lat 46°10 North I demand her Course Departure and Longitude in

Capes of Virg Latt 37°00 N 2293 Capes of Virg Long 75°44 W
Latt in 46°10 N 3150 Lat of Long 34.42 E
9°10 | 237 Long in 40°42 W
Lat of Latt 60
550

as the Distance ---------- 1646 ---------- 3.216957
Is to Radius ---------- 90°00 ---------- 10
So is the Lat of Latt ---------- 550 ---------- 2.740863
To SE Course ---------- 19°30 ---------- 9.523406
70°30 SE

as Radius ---------- 90°00 ---------- 10
Is to the Distance ---------- 1646 ---------- 3.216957
So is S Course ---------- 70°30 ---------- 9.974347
To the Departure ---------- 1544 ---------- 3.191304

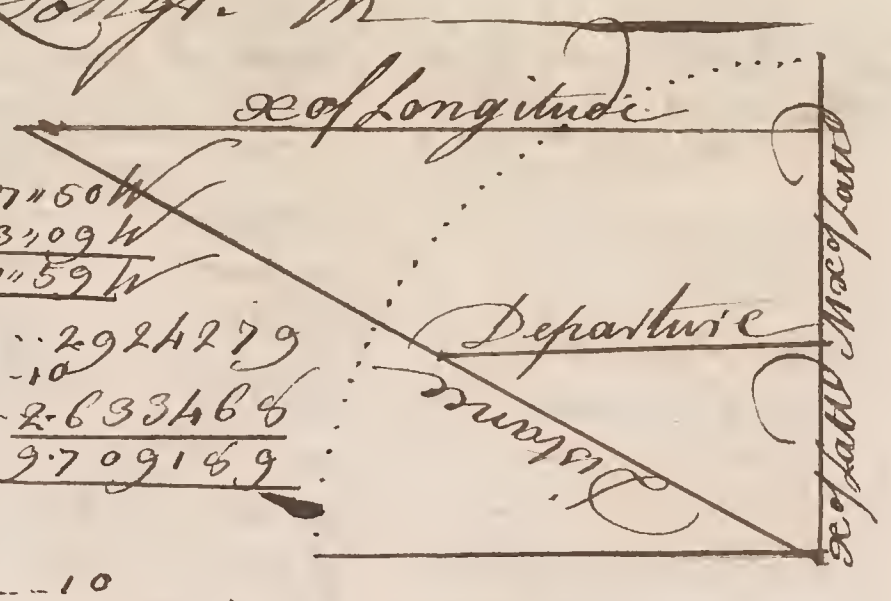
as SE Course ---------- 19°30 ---------- 9.523495
Is to Mer of Latt ---------- 787 ---------- 2.867467
So is S Course ---------- 70°30 ---------- 9.974347
To the Lat of Longt ---------- 2062 ---------- 12.841814
3.316329

60/2062/34
160
282
240
42

A Ship from Londonderry Sails 640 Miles between the North & the West when she is by observation in Lat.e 62°.10 North I demand her Course Departure and Long.e in

Lond.n Derry Lat.d 55°.00 N 39 66
Lat.d in 62°.10 N 474 796
7°.10 | 626
60
430

Lond.n Derry long.e 07°.60 W
Ship's long.e 28°.09 W
Long.e in 30°.59 W



as the Distance ..... 640 ..... 2.924279
Is to Radius ..... 90°.00 10
So is the Ex of Lat.d ..... 430 ..... 2.633466
Is the S C Course ..... 30°.47 ..... 9.709169
59°.13 SC

as Radius ..... 90°.00 10
Is to the Distance ..... 640 ..... 2.924279
So is S Course ..... 59°.13 ..... 9.934046
To the Departure ..... 721.7 ..... 2.858325

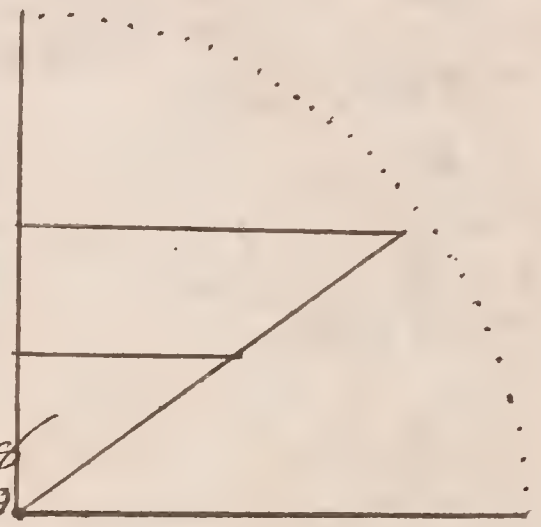
60|13669|23
12 0
1 69
1 60
9

as S C Course ..... 30°.47 ..... 9.709094
Is to Mer.x of Lat.d ..... 626 ..... 2.916030
So is S Course ..... 59°.13 ..... 9.934046
To the Ex of Long.e ..... 1316.9 ..... 12.652076
3.142964

A Ship from Whitby Sails between the North & E. East till her Departure be 271 Miles when she arrives in Lat.e 58 North I demand her Course Distance and Longitude in

Whitby Lat.d 54°.30 N
Lat.d in 56°.00 N 294
33°.30 | 378
60
Ex of Lat.d 210

Whitby Long.e 00°.50 W
Ex of Long.e 06°.06 E
Long.e in 7°.16 E



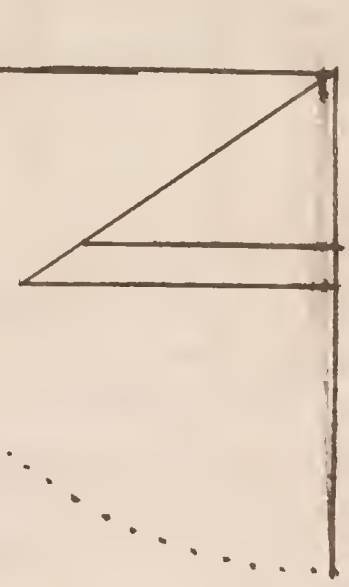
as the Ex of Lat.d ..... 210 ..... 2.322219
Is to Radius ..... 90°.00 10
So is the Departure ..... 271 ..... 2.432969
To the S Course ..... 52°.14 ..... 10.110750
S C 37°.46

As S Course ..... 52°.14 ..... 9.897908
Is to the Departure ..... 271 ..... 2.432969
So is Radius ..... 90°.00 10
To the Distance ..... 342.6 ..... 2.535061

as S C
do S C Course ..... 37°.46 ..... 9.786709
Is to Merid.n of Lat.d ..... 376 ..... 2.677492
So is S Course ..... 52°.14 ..... 9.897908
12.475400
To the Ex of Longitude ..... 467.9 ..... 2.678331

60|46 56|16
4 80
8

A Ship from the Rock of Lisbon Sails between the South & the west till her Departure be 1000 Miles when she is by Observation in Latt. 27° 25 North I demand her Course Distance and Longitude in



Rock of Lisbon Latt 38° 52 N 2534
Latt in 27. 25 N 1712
11° 27' 822
x of Latt 60
657

Rock of Lisbon Long 09° 50 W.
x of Long 19° 57 W.
Long in 29° 47 W.

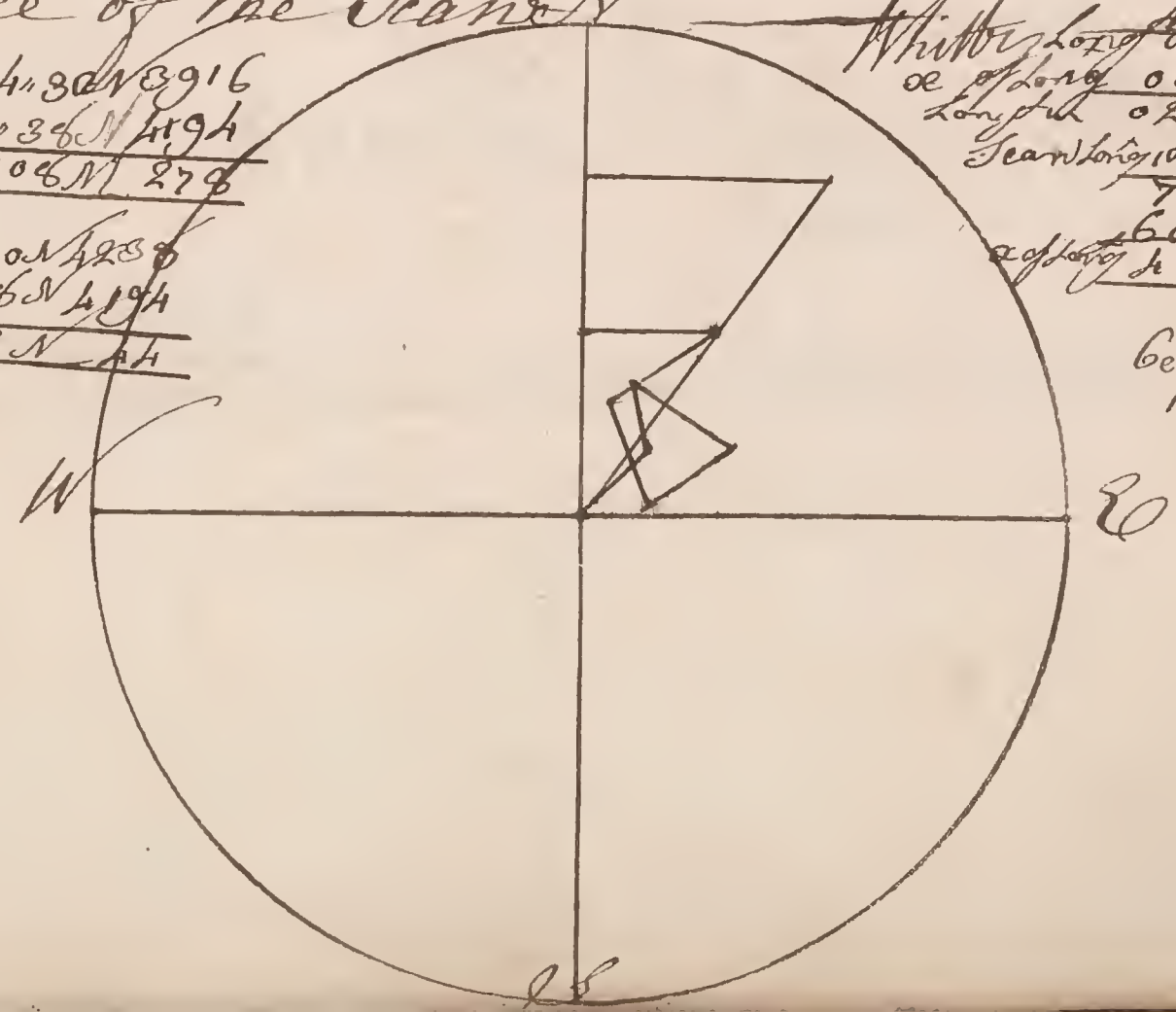
as the x of Latt 657 2486957
Is to Radius ..... 90°00 10
So is the Departure ..... 1000 ..... 3.0000000
So the Course ..... 55°31 ..... 10.1630143

as Course ..... 55°31 9916060
Is to the Departure 1000 3000000
So is Radius ..... 90°00 10
So the Distance ..... 1218 ..... 3.0783920

60 / 1197/19
60
597
540
57

as S Course ..... 34°29 9752944
Is to M x of Latt 822 2914672
So is S Course ..... 55°31 9916060
So the x of Longt ..... 1197 ..... 12.6830952
3.0776006

A Ship from Whitby for the Scarr Sails first N E 78 Miles then S E by E 56 Miles then S E by E 82 Miles then S W by W 74 Miles then N W by W 81 Miles and then N E by E 107 Miles I demand her direct Course Diff of Latt. Departure and Distance with y Latt and Longt now in & also the Bearing and Distance of the Scarr



Whitby Latt 54°30 N 3916
x of Latt 02°36 N 194
Latt in 57°06 N 270

Whitby Long 00°50 W
x of Long 08°12 E
Long in 02°22 E
Scarr Long 10°20 E
7°56
60
x of Long 476

Scarr Latt 57°30 N 4280
Latt in 57°06 N 4194
x of Latt 00°22 N 44

60 / 1586/2
120
38

60 / 192/3
180
12

Courses	Points	Distances	N ex of Latitude	S	E Departure	W
N E	4	78	55.2		55.2	
N B W	1	56	54.9			10.9
S E B E	5	62		45.6	66.2	
S W B W	5	74		41.1		61.5
N N W	2	81	74.6			31.0
N E B E	5	107	59.5		66.9	
			244.4	86.7	212.3	103.4
			86.7		103.4	
			157.7		108.9	

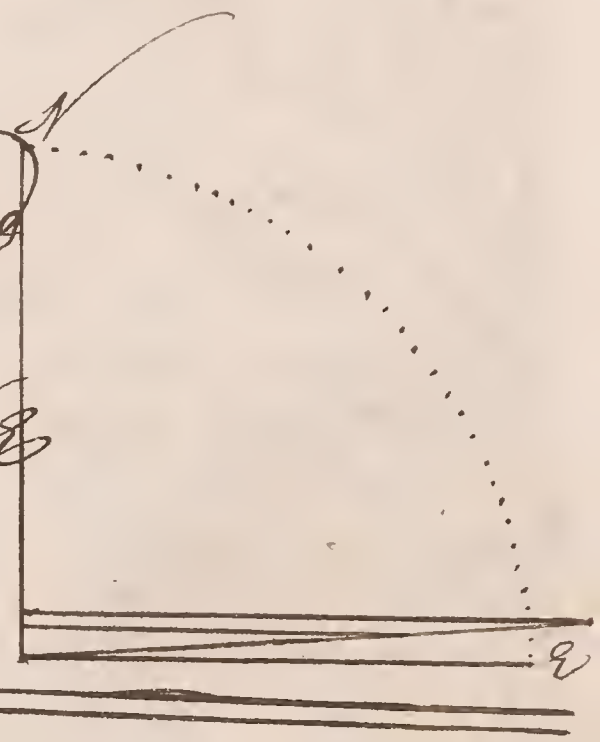
as the ex of Latd ---------- 157.7 ---------- 2.197682
To to Radius ---------- 90.00 ---------- 10
To is the Dept ---------- 108.9 ---------- 2.037026
To the S Course ---------- S 34 37 ---------- 9.663919 6
S 55 23

as S Course ---------- 34.37 ---------- 9.754412
To to the Departure ---------- 108.9 ---------- 2.037026
To to Radius ---------- 90.00 ---------- 10
To the Distance ---------- 191.7 ---------- 2.262616

as S E Course ---------- 55.23 ---------- 2.915865
To to M ex of Latd ---------- 27 6 ---------- 2.144045
To is S Course ---------- 34.37 ---------- 9.754412
To the ex of Long ---------- 191.9 ---------- 12.198457
2.283072

as M ex of Latd ---------- 44 ---------- 1.643453
To to Radius ---------- 90.00 ---------- 10
To to the ex of Long ---------- 47 6 ---------- 2.679426
To the S Course ---------- S 46.44 ---------- 11.035975
S 66 0.516

as S E Course ---------- 0.516 ---------- 8.962801
To to the ex of Latd ---------- 22 ---------- 1.342423
To is Radius ---------- 90.00 ---------- 10
To the Distance ---------- 239.6 ---------- 2.379622



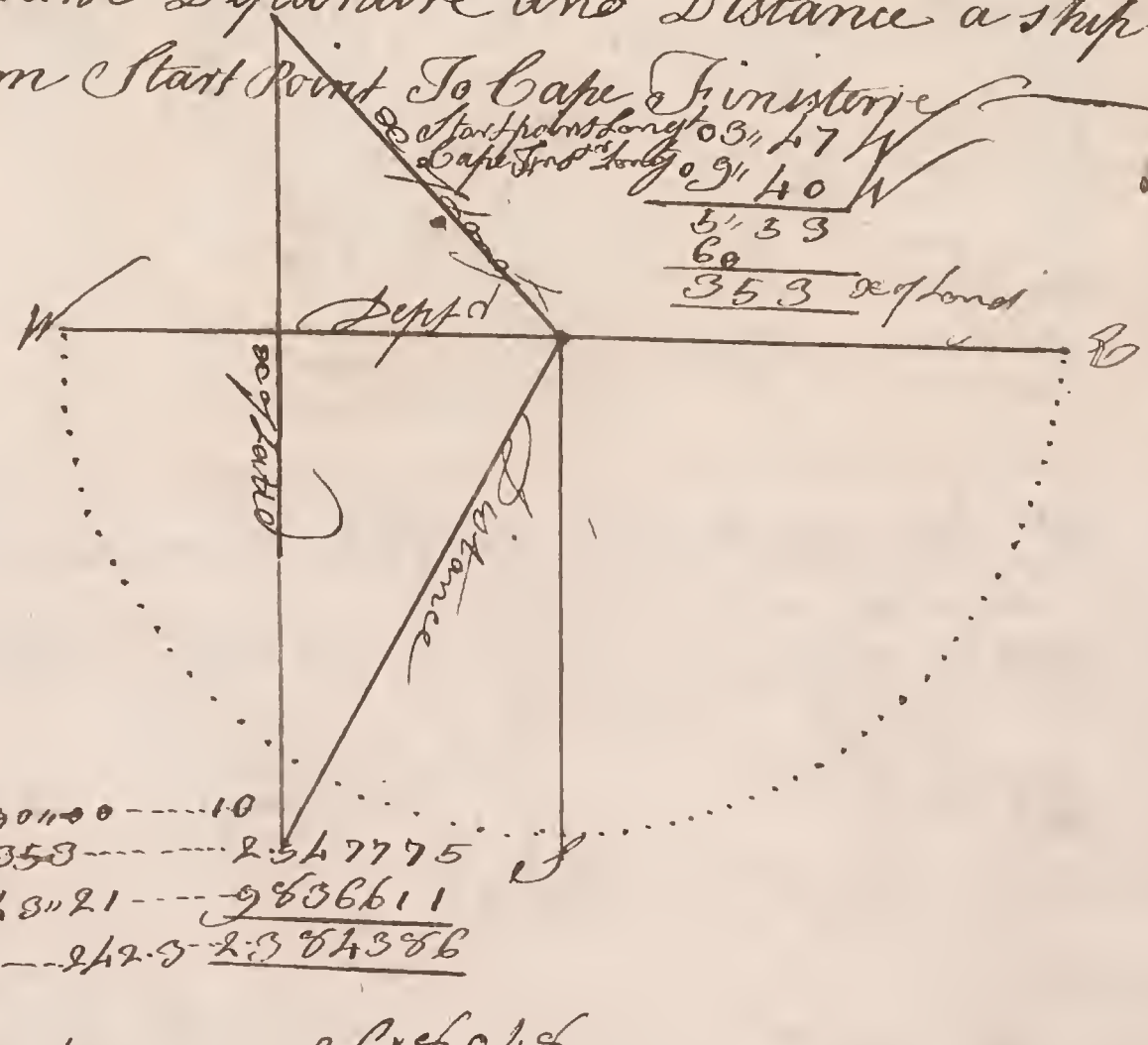
Q. Ans^d her Direct Course N E B N ex of Latd is 157.7 Miles Departure is 108.9 miles Dist 191.7 miles Latt^d in 57.0 & N Long^t in 02.22 & Bearing of the Scan is E B N ½ E Distance 239.6 miles

Middle Latitude Sailing 1759

The propotion on which middle Latitude Sailing depends is that the Compliment of the middle Latitude is to the Departure as Radius is to the Difference of Longitude.

I Demand what Course Departure and Distance a ship makes in Sailing from Start Point To Cape Finisterre

Start point Latd 50°.07 N
Cape Finst Latd 43°.12 N
6°.55
60
415
50°.07
43°.12
M Latd 93°.19
46°.39
C M Latd 90°.00
43°.21



as Radius ---------- 90°.00 ---- 10
To the Dff of Long ---- 353 ---- 2.547775
To the C M Latd ---- 43°.21 ---- 9.836611
To the Departure ---- 242.3 ---- 2.384386

as the Dff of Latd ---- 415 ---- 2.618046
To the Radius ---- 90°.00 ---- 10
To the Dept d ---- 242.4 ---- 2.384386
To the Course ---- 30°.17 ---- 9.766432

as the Course ---- 30°.17 ---- 9.702669
To the Dept d ---- 242.3 ---- 2.384386
To the Radius ---- 90°.00 ---- 10
To the Distance ---- 486 ---- 2.686717

I Demand what Course Departure and Distance a Ship makes in Sailing from Whitby to Gottenburgh

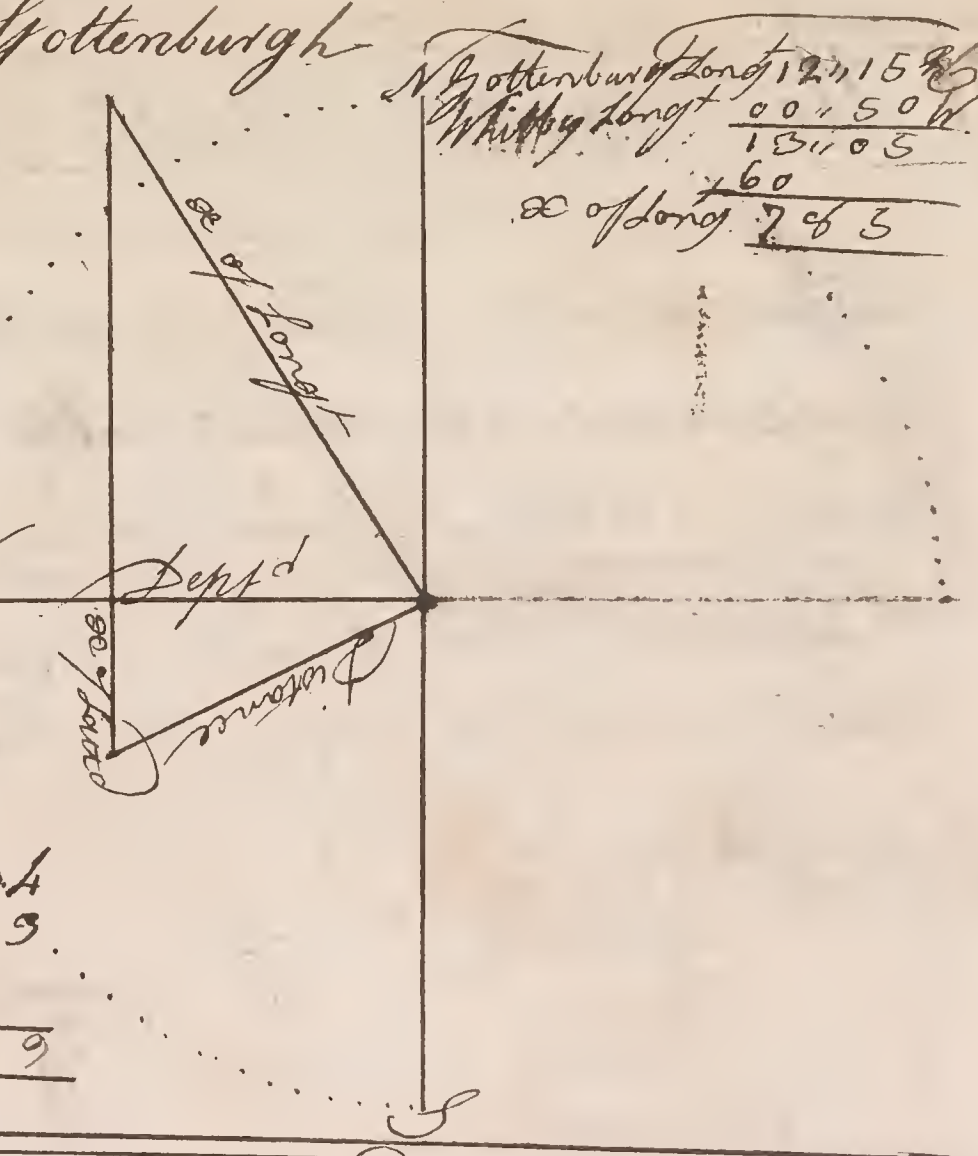
Gottenburgh Latt 57°50 N
Whitby Latt 54°30 N
3°20
60
200
57°50
54°30
112°20
56°10
90°00
33°50

N Gottenburgh Long 12°15 E
Whitby Long 00°50 W
13°05
60
ꝺe of Long 785

as Radius ---- 90°00 ---- 10
Is to the ꝺe of Long - 785 ---- 2.894670
Is to S C M Latt --- 33°50 --- 9.745663
Is to the Dept ---- 437.1 - 2.640553

as the ꝺe of Latt ---- 200 ---- 2.301030
Is to Radius ---- 90°00 - 10
Is to the Dept ---- 437.1 - 2.640553
Is to the Course 65°25 10.339523

as S Course ---- 65°25 ---- 9.956704
Is to the Dept ---- 437.1 ---- 2.640553
Is to Radius ---- 90°00 --- 10
Is to the Distance - 1807 - 2.684849



a Ship from Oporto Sails SWbW 626 miles I demand her Departure with the Latt and Longitude in

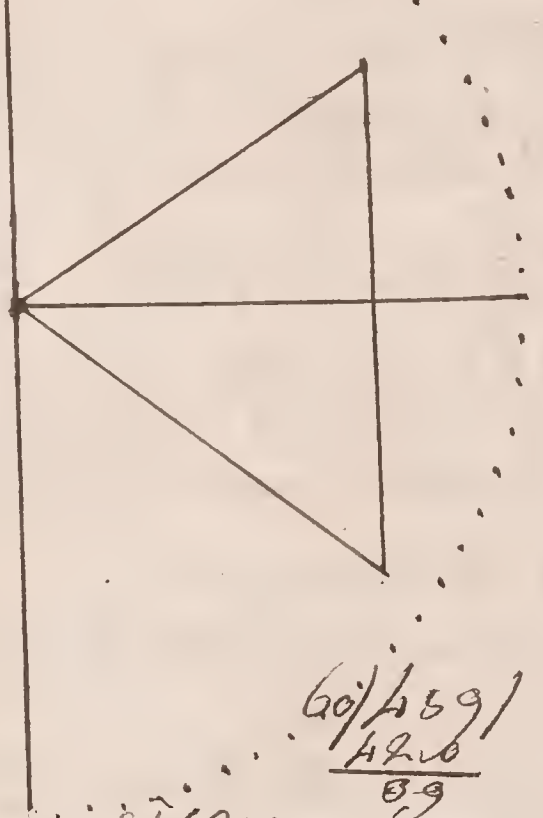
Oporto Latt 41°19 N
ꝺe of Latt 07°49 S
Latt in 33°31
41°10
74°41
37°20
90°00
52°40

Oporto Long 09°25 W
ꝺe of Long 14°24 W
Long in 23°49 W
90°00
56°15
33°45

as Radius ---- 90°00 ---- 10
Is to the Distance ---- 626 ---- 2.916980
Is to S Course ---- 56°15 ---- 2.919846
Is to the Departure ---- 666.6 - 2.836826

as Radius ---- 90°00 ---- 10
Is to the Distance ---- 626 ---- 2.916980
Is to S C Course ---- 33°45 ---- 9.744739
Is to the ꝺe of Latt ---- 458.9 ---- 2.661719

as S C M Latt ---- 52°40 ---- 9.900403
Is to the Dept ---- 666 ---- 2.836826
Is to Radius ---- 90°00 --- 10
Is to the ꝺe of Long t --- 663.7 - 2.936893



60/459.1
42.6
39

60/663.7
60
264
240
24

A Ship from New york sails N E B E ½ E 1284 miles I demand her Departure with Latitude and Longitude in

New york Latd 40°-56 N
ɔx of Latd 09°-09 N
50°-07
40°-58
M Latd 91°-05
45°-32
C M Latd 90°-00
44°-28

New york Long 73°-53 W
ɔx of Long 27°-37 E
Long in 46°-16 W

60/549/9
54.0
9

60/657/27
12.0
457
42.0
97

as Radius ..... 90°-00 10
I. to the Distance ..... 1284 ..... 3.106565
I. to S Course ..... 64°-41 ..... 9.956146
I. to the Departure ..... 1161 ..... 3.064713

as Radius ..... 90°-00 10
I. to the Distance ..... 1284 ..... 3.106565
I. to S E Course ..... 25°-19 ..... 9.631059
I. to the ɔx of Latd ..... 549.1 ..... 2.737624

as S E M Latd ..... 44°-28 ..... 9.845204
I. to the Dep.d ..... 1161 ..... 3.064713
I. to Radius ..... 90°-00 10
I. to the ɔx of Long.t ..... 1657 ..... 3.219909

A Ship from Louisburgh S E B S ½ E till her Departure 648 miles I demand her Distance with the Latitude and Longitude in

Louisburgh Latd 46°-00 N
ɔx of Latd 15°-22 S
30°-38
46°-00
M Latd 76°-38
38°-19
C M Latd 90°-00
51°-41

Louisburgh Long 56°-30 W
ɔx of Long 14°-20 E
Long in 40°-10 W

90°-00
36°-34
53°-26 S E C

as S Course ..... 36°-34 ..... 9.775070
I. to the Dep.d ..... 648 ..... 2.835056
I. to Radius ..... 90°-00 10
I. to the Distance ..... 1148 ..... 3.059986

as Radius ..... 90°-00 10
I. to the Distance ..... 1148 ..... 3.059986
I. to S E Course ..... 53°-26 ..... 9.904604
I. to the ɔx of Latd ..... 922.1 ..... 2.964590

as S E M Latd ..... 51°-41 ..... 9.894646
I. to the Dep.d ..... 648 ..... 2.835056
I. to Radius ..... 90°-00 10
I. to the ɔx of Long.t ..... 671.6 ..... 2.940410

60/922/15
60
322
300
22

60/672/14
60
272
240
32

A Ship from Cape Clear Sails W S W till her Departure be
675 miles I demand her Distance with the Latt^d and Long^t in

Cape Clear Latt^d 51° 57 S Cape clear Long^t 11° 10 W
æ of Latt^d 06° 02 S æ of Long^t 22° 12 W
44° 55 Long^t in 32° 22 W
51° 57
97° 52
M Latt 46° 56 S C C 90° 00 / 67° 30 / 22° 30 60 / 062 / 6 / 360 / 2
C M Latt 90° 00
41° 04

60 / 1332 / 22
120
132
120
12

as S Course ..... 67° 30 ..... 9.965615
Is to the Dep^t ..... 675 ..... 2.942006
So is Radius ..... 90° 00 10
To the Distance ..... 947.1 ..... 2.976393

as Radius ..... 90° 00 10
Is to the Distance ..... 947.1 ..... 2.976393
So is S C Course ..... 22° 30 ..... 9.582640
To the æ of Latt^d ..... 362.5 ..... 2.559233

as S C M Latt^d ..... 41° 04 ..... 9.817523
Is to Dep^t ..... 675 ..... 2.942006
So is Radius ..... 90° 00 10
To the æ of Long^t ..... 1085.2 ..... 3.124465

A Ship from Ushant Sails S W ½ W till she arrive in Latt^d
36° 20 North I demand her Departure Distance and Long^t in

Ushant Latt^d 46° 30 S Ushant Long^t 05° 02 W
Latt^d in 36° 20 N æ of Long^t 17° 03 W
10° 10 Long^t in 22° 05 W
60
æ of Latt^d 610
46° 30
36° 20
½ 82° 50
M Latt 41° 25
C M Latt 90° 00
46° 35

90° 00
50° 37
39° 23 S C C

60 / 1023 / 17
60
423
420
3

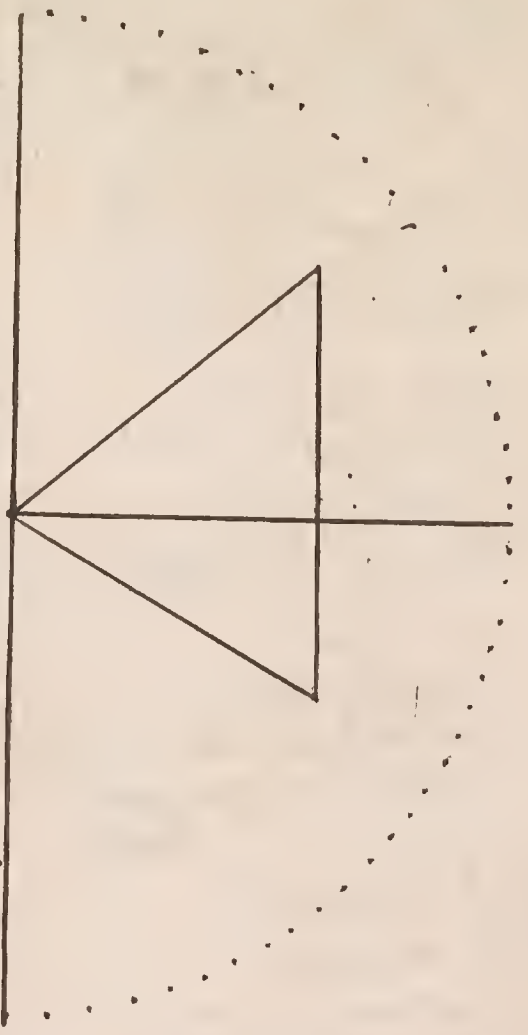
as S C Course ..... 39° 23 ..... 9.802485
Is to the æ of Latt^d ..... 610 ..... 2.785530
So is Radius ..... 90° 00 10
To the Distance ..... 961.3 ..... 2.982905

as Radius ..... 90° 00 10
Is to the Dist ..... 961.3 ..... 2.982905
So is S Course ..... 50° 37 ..... 9.889183
To the Dep^t ..... 741.1 ..... 2.871088

as S C M Latt^d ..... 46° 35 ..... 9.861161
Is to the Dep^t ..... 741.1 ..... 2.871088
So is Radius ..... 90° 00 10
To the æ of Long^t ..... 1023 ..... 3.009677

A Ship Cape Trefalgar Sails N W ½ W ½ W till she is by Observation in Latd 42°10 N with I demand her Departure Distance and Longitude in

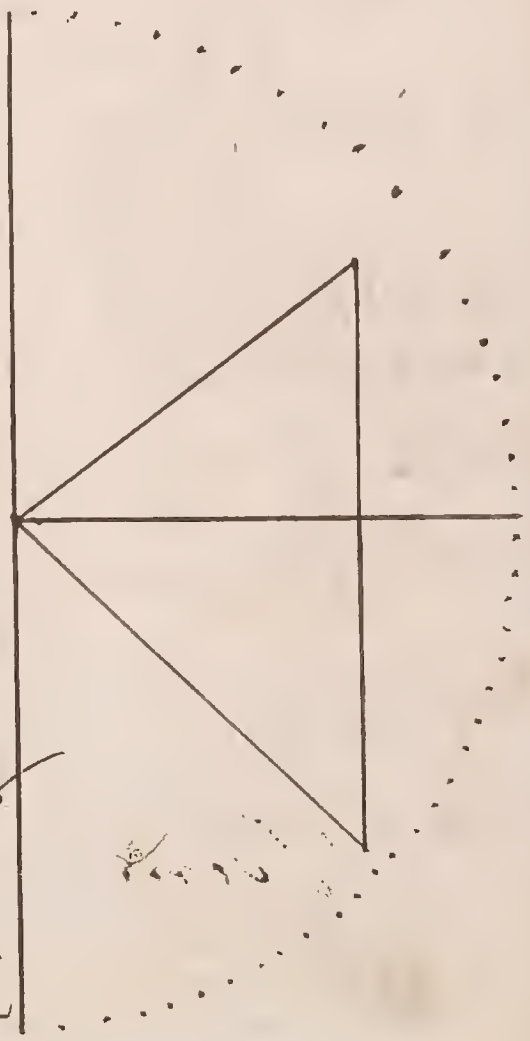
Cape Trefalgar Latd 36°10 N Cape Trafalgar Long 6°06°10 W
Latd in 42°10 N ∝ of Long 12°55 W
6°00 Long in 19°05 W
60 60 | 775 | 17
360 60
36°10 175
42°10 120
M Latd ½ 78°20 55
39°10
C M Latd 90°00 90°00
50°50 59°04
30°56



as S E Course	30°56	9·710997
Is to the ∝ of Latd	360	2·556302
So is Radius	90°00	10
To the Dist	7004	2·846315
as Radius	90°00	10
So is the Dist	7004	2·846315
So is S Course	59°04	9·933369
To the Dept	6007	2·779684
as S E M Latd	50°50	9·669478
Is to the Dept	6007	2·779684
So is Radius	90°00	10
To the ∝ of Long	7749	2·889206

A Ship from Ushant Sails E b S miles between the South & the West when her Departure is 672 miles I demand her Course with the Latd and Long in

Ushant Latd 46°30 N Ushant Long 5°20 W
∝ of Latd 1°07 S ∝ of Long 15°37 W
39°53 Long in 20°57 W
Latd in 46°30 60 | 517 | 6
M Latd ½ 46°23 460
44°11 37
C M Latd 90°00
45°49



as the Distance	644	2·926096
So is Radius	90°00	10
So is the Dept	672	2·827369
To the S Course	52°25	9·769273
	37°35	
as Radius	90°00	10
So is the Dist	644	2·926096
So is S E Course	37°35	9·769273
To the ∝ of Latd	5172	2·718665
as S E M Latd	45°49	9·655566
So is the Dept	672	2·827369
So is Radius	90°00	10
To the ∝ of Long	937·1	2·971761

a Ship from Whitby Sails 684 miles between the North and the East when her Departure is 300 miles I demand her Course with Latt and Long^t in

Whitby Latt 54°30 N
Dep of Latt 66°45 N
Latt in 64°45 N

54°30
119°15
59°07
M Latt 60°00
C M Latt 30°28

60/615/1
60
15

Whitby Long 00°50 W
Dep of Long 09°53 W
Long^t in 9°03 W

60/59 3/9
54 0/9
53

as the Distance ------ 684 ------ 2.834056
Is to Radius ------ 90°00 ------ 10
So is the Dep^t ---- 300 ------ 2.477121
To the Course ---- 26°1 ---- 2.642065
To C 68°59

as Radius ------ 90°00 ------ 10
Is to the Dist ------ 684 ------ 2.834056
So is S C Course ---- 68°59 ---- 9.968659
To the Dep of Latt --- 614.7 --- 2.778715

as S C M Latt ------ 30°28 ------ 9.703964
Is to the Dep^t ------ 300 ------ 2.477121
So is Radius ------ 90°00 ------ 10
To the Dep of Long^t ---- 593.1 ---- 2.773157

---

a Ship from the Capes of Virginia Sails 1654 miles between the North & the East when she is by Observation in Latt 46°10 N I demand her Course Departure and Longitude in

Capes of Virg Latt 37°00 N
Latt in 46°10 N
9°10
Dep of Latt 60
550
37°00
46°10
M Latt 183°10
C M Latt 41°05
90°00
48°25

Capes of Virg Long 75°44 W
Dep of Long 24°37 E
Long^t in 41°07 W

60/2077/3
180
2277
240
34

as the Dist ------ 1654 ------ 3.218957
Is to Radius ------ 90°00 ------ 10
So is the Dep of Latt ---- 550 ---- 2.740363
To the S C Course ---- 19°30 ---- 9.521406
To C 70°30

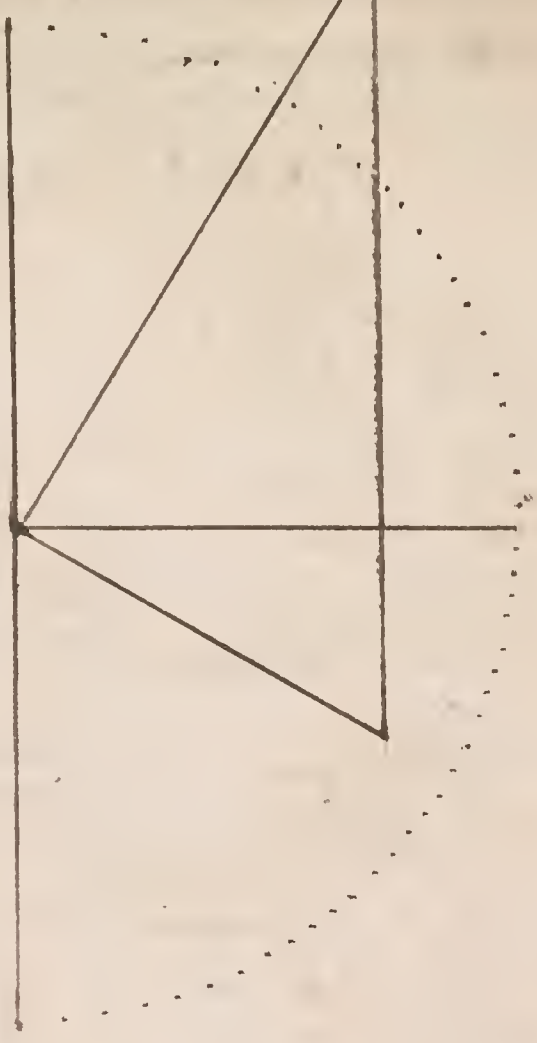
as Radius ------ 90°00 ------ 10
Is to the Dist ------ 1654 ------ 3.218957
So is S C Course ---- 70°30 ---- 9.974847
To the Dep^t ---- 1544 ---- 3.191804

as S C M Latt ------ 48°25 ------ 9.875696
Is to the Dep^t ------ 1544 ------ 3.191804
So is Radius ------ 90°00 ------ 10
To the Dep of Long^t ---- 2077 ---- 3.317406

A Ship from Londonderry Sails 640 miles between the North & the West when she is by Observation in Latd 62°10 North I demand Course Departure and Long[t] in

Londonderry Lat[d] 55°00 N
Lat[d] in 62°10 N
7°10
60
430
55°00
62°10
M Lat[d] 117°10
58°35
C M Lat[d] 2°00
31°25

Londonderry long[t] 07°50 W
D[o] long 23°04 W
Long[t] in 30°54 W
60 1864 23
120
164
120
4



as the Distance ..... 640 ..... 2.924279
So is Radius ..... 90°00 10
So is D[o] Latd ..... 430 ..... 2.633466
So is the S C Course ..... 30°47 ..... 9.709169
S C 59°13

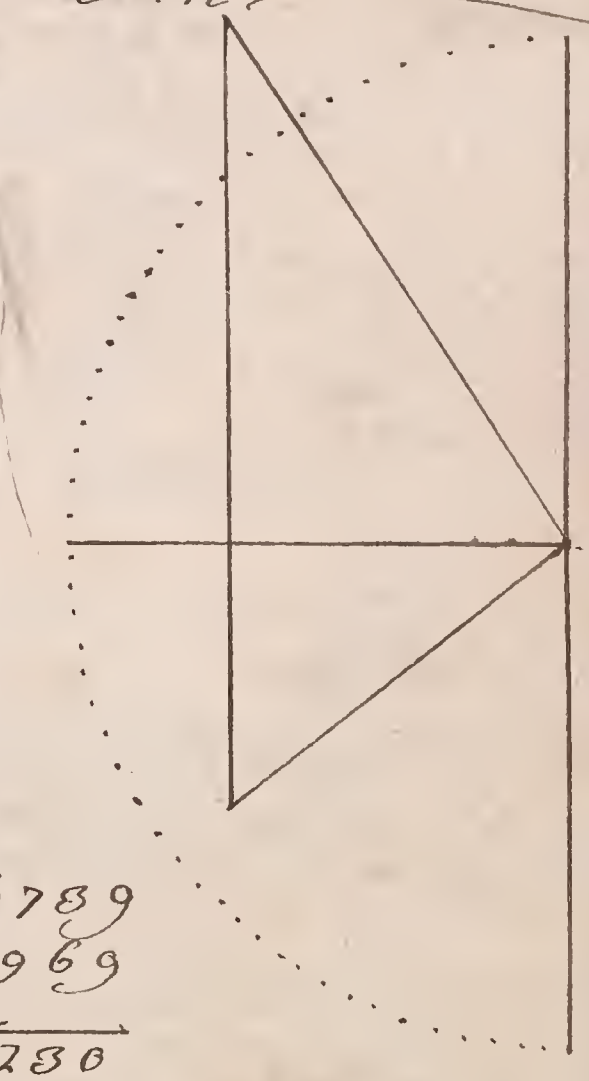
as Radius ..... 90°00 10
So is the Dist ..... 640 ..... 2.924279
So is S Course ..... 59°13 ..... 9.934046
So is the Dep[t] ..... 721.7 ..... 2.858327

as S C M Latd ..... 31°25 ..... 9.713053
So is the Dep[t] ..... 721.7 ..... 2.858327
So is Radius ..... 90°00 10
So is the D[o] Long[t] ..... 1864 ..... 3.141274

A Ship from Whitby Sails between the North & the East till her Departure be 271 miles when she arrives in Latd 56 North I demand her Course Distance and Longitude in

Whitby Latd 54°30 N
Latd in 56°00 N
3°30
60
210
54°30
56°00
M Latd 112°30
56°15
C M Latd 90°00
33°45

Whitby long[t] 00°50 W
D[o] long 06°08 E
Long[t] in 7°18 E
60 468 18
240
8



as the D[o] Latd ..... 210 ..... 2.322219
So is Radius ..... 90°00 .....
So is the Dep[t] ..... 271 ..... 2.432969
So is the S Course ..... 52°14 ..... 10.110750
S C C 37°46

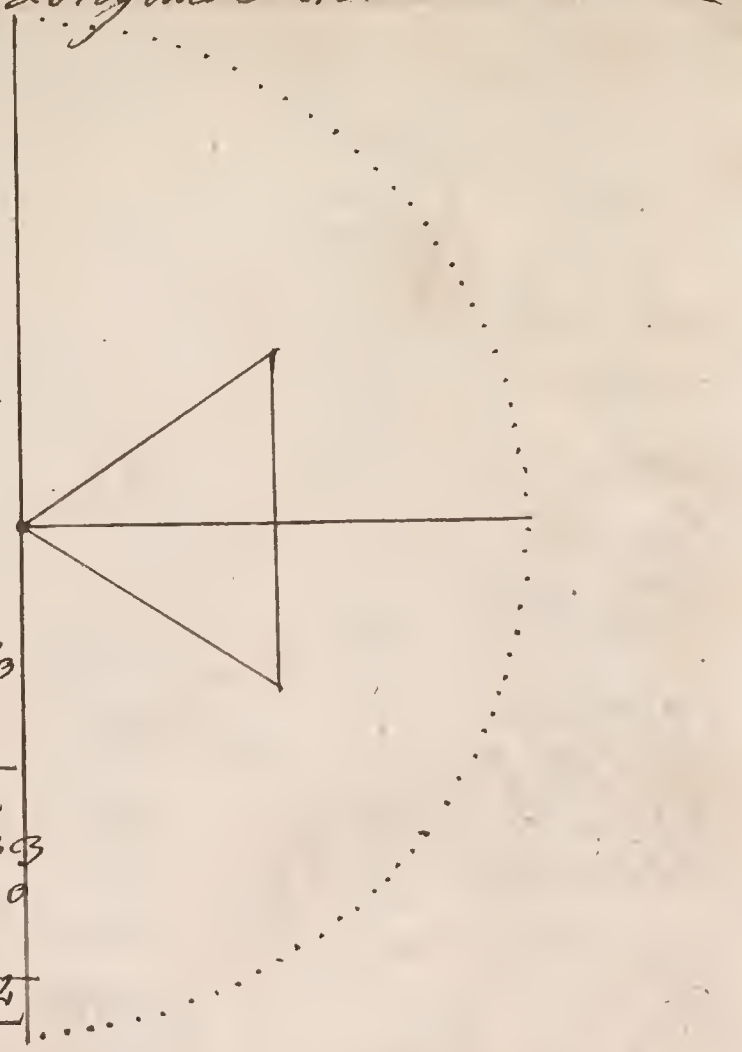
as S Course ..... 52°14 ..... 9.897906
So is the Dep[t] ..... 271 ..... 2.432969
So is Radius ..... 90°00 10
So is the Distance ..... 342.6 ..... 2.535061

as S C M Latd ..... 33°45 ..... 9.744789
So is the Dep[t] ..... 271 ..... 2.432969
So is Radius ..... 90°00 10
So is the D[o] Long[t] ..... 487.8 ..... 2.666230

A Ship from the Rock of Lisbon Sails betwen the South and the West till her Departure be 1000 miles when she is by observation in Latd 27°25 North I demand her Course Distance and Longitude in

Rock of Lisbon Latd 38°52 N
Latd in 27°25 N
11°27
60
667
966°52
27°25
M Latd 1664°17
33°6
C M Latd 9°00
56°52

Rock of Lisbon Long 9°50 W
ꝛe of Long 19°57 W
Long in 29°47 W
60 | 1194 | 19
60
594
540
54



As the ꝛe of Latd ---- 667 ---- 2.826957
Is to Radius ---- 90°00 ---- 10
So is the Dept ---- 1000 ---- 3 00 00 00
So is the Course --- 55°31 --- 10.180043

As Course ---- 55°31 ---- 2.916060
Is to the Dept ---- 1000 ---- 3.000000
So is Radius ---- 90°00 ---- 10
So is the Dept ---- 1213 ---- 3.083920

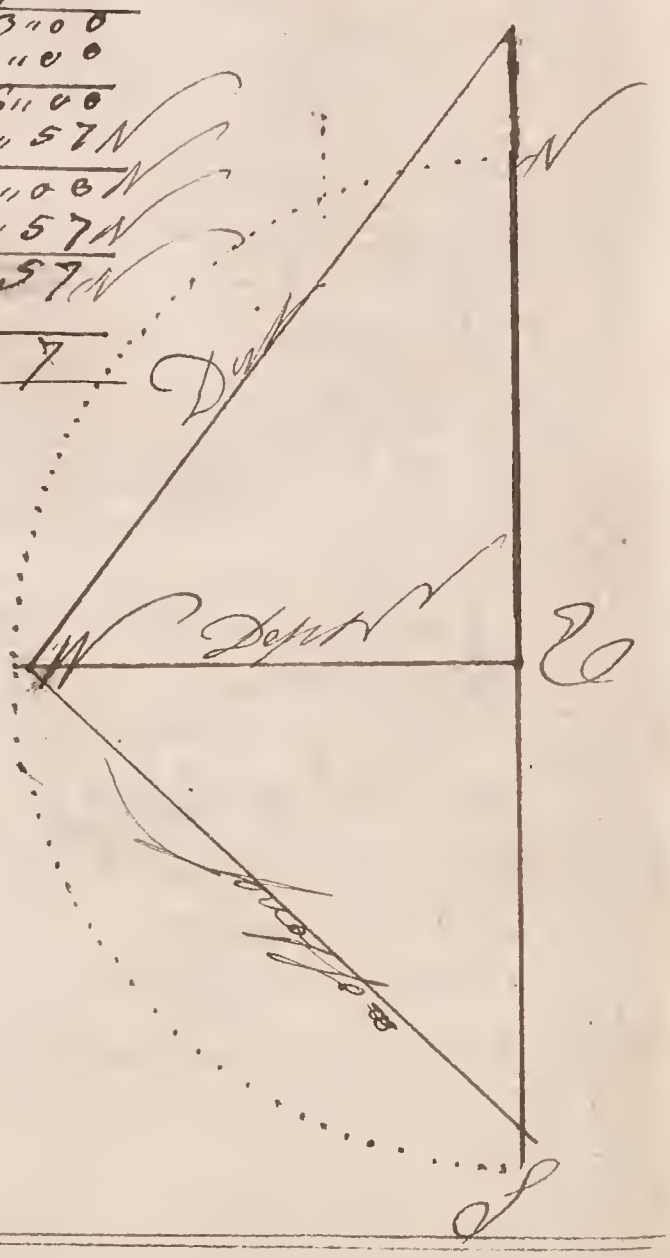
As S C M Latd ---- 56°52 ---- 2.922983
So is to the Dept ---- 1000 ---- 3.000000
So is Radius ---- 90°00 ---- 10
So is the ꝛe of Long ---- 1194 ---- 3.077062

A ship from the Lizard Sails between the South & the West till her Departure be 648 Miles when she arrives in Long 20° West I demand her Course Distance and Latitude in

Lizard Long 05°34
Long in 20°06 W
ꝛe of Long 14°46 W
60
886

As the ꝛe of Long ---- 886 ---- 2.947483
Is to Radius ---- 90°00 ---- 10
So is the Dept ---- 648 ---- 2.811575
So is the C M Latd ---- 47°00 ---- 9.864141

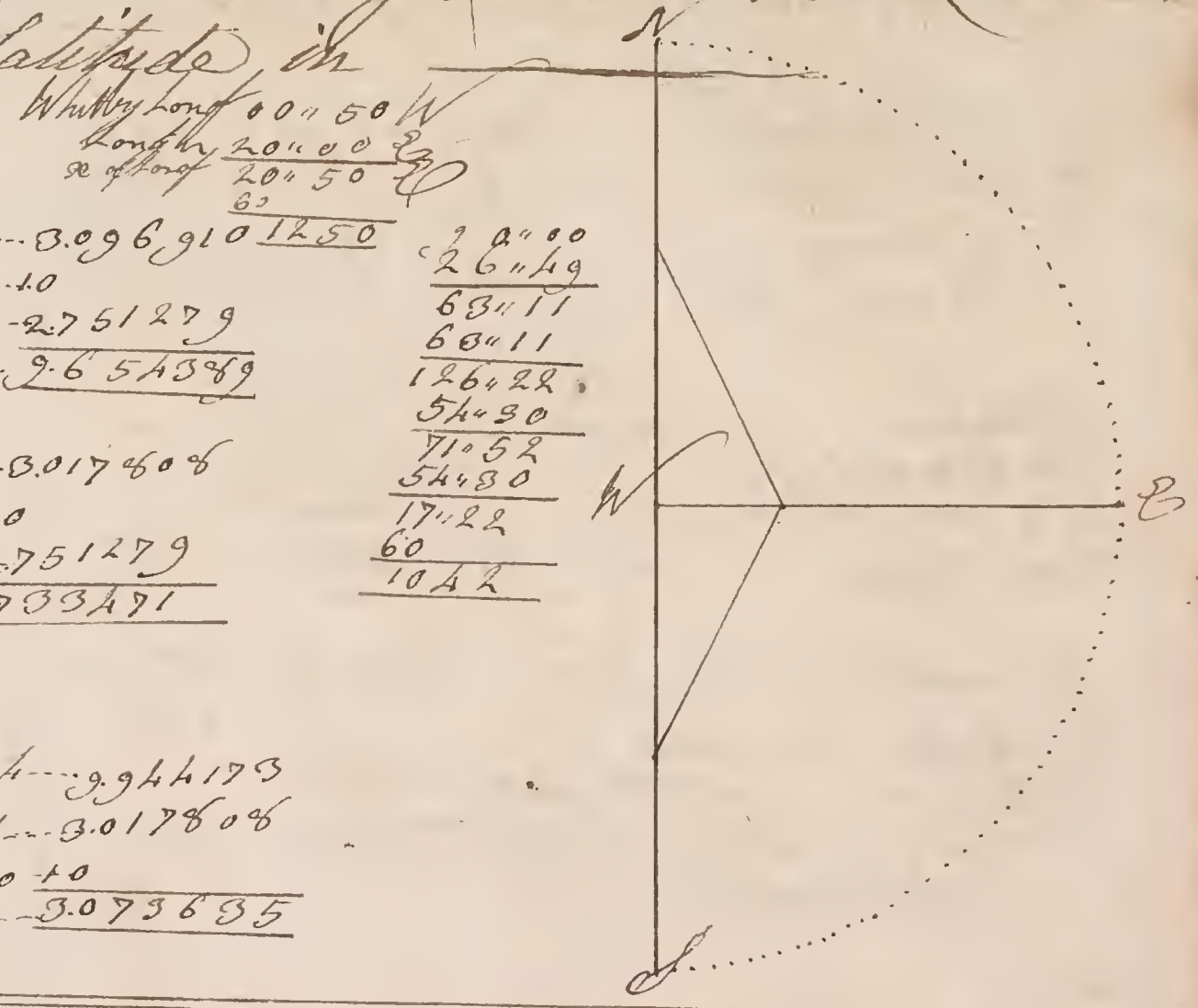
C M Latd 90°00
47°00
M Latd 43°00
Latd in 43°00
66°00
Latd from 9°57 N
Latd in 36°03 N
Latd from 49°57 N
ꝛe of Latd 1957 N
60
897



As the ꝛe of Latd --- 897 --- 2.952725
Is to Radius ---- 90°00 ---- 10.
So is the Dept ---- 648 ---- 2.811575
So is the Course --- 52°56 --- 9.877850
87°02

As Sine C Course --- 52°56 ---- 9.902156
Is to the ꝛe of Latd ---- 897 --- 2.952725
So is Radius ---- 90°00 ---- 10
So is the Distance --- 1048 --- 3.020567

A Ship from Whitby Sails between the North and the East till her Departure be 364 Miles when she arrives in Long.d 20° East I demand her Course Distance and Latitude in



Whitby Long 00° 50 W
Long.h 20° 00 E
Diff of Long 20° 50 E

As the Diff of Long	1250	3.096910	1250
So to Radius	90°00	10	
So is the Dep.d	564	2.751279	
So to L.d C.d Mar.e	26°49	9.654389	

As the Diff of Lat.d	1042	3.017606	
So to Radius	90°00	10	
So is the Dep.d	564	2.751279	
So to the I Course	28°26	9.733471	
I C C	61°34		

As I C Course	61°34	9.944173	
So to the Diff of Lat.d	564	3.017806	
So is Radius	90°00	10	
So the Distance	1065	3.073635	

2 0°00
26°49
63°11
60°11
126°22
54°30
71°52
54°30
17°22
60
1042

A Ship from Whitby for the Scarr Sails first NE 74 miles then N BW 56 miles then S E B E 62 miles then S W B W 74 miles then N W 61 miles then N E B E 107 m

I demand her direct Course Diff of Latt.d Departure and Distance with the Latt.d and Long.d now in as also the Bearing and Distance of the Scarr

Whitby Latt 54°29 N
D of Lat 02°36 N
Lat in 57°07 N
Scarr Lat.d 57°30 N
D of Latt 23

Whitby Long 00°50 W
D of Long 03°14 E
Long in 2°24 E
Scarr Long 10°20 E
7°56
60
476

Courses	Dist	D of Latitude N	D of Latitude S	Departure E	Departure W
N E	74	55.2		55.2	
N B W	56	54.9			10.9
S E B E	62		45.6	66.2	
S W B W	74		41.1		61.5
N W	61	74.6			31.0
N E B E	107	59.5		86.9	
		244.4	86.7	212.3	103.4
		86.7	86.7	103.4	
		157.7		108.9	

As the D of Lat 157.7 — 2.197682
So to Radius 90°00 — 10
So is the Dep.d 108.9 — 2037026
So to the I Course 54°37 — 9.839708

as Sine Course --- 34°37 --- 9.754412
Is to the Dep^t ----- 108.9 ----- 2.037028
So is Radius ----- 90°00 --- 10
To the Distance ---- 191.7 -- 2.282616

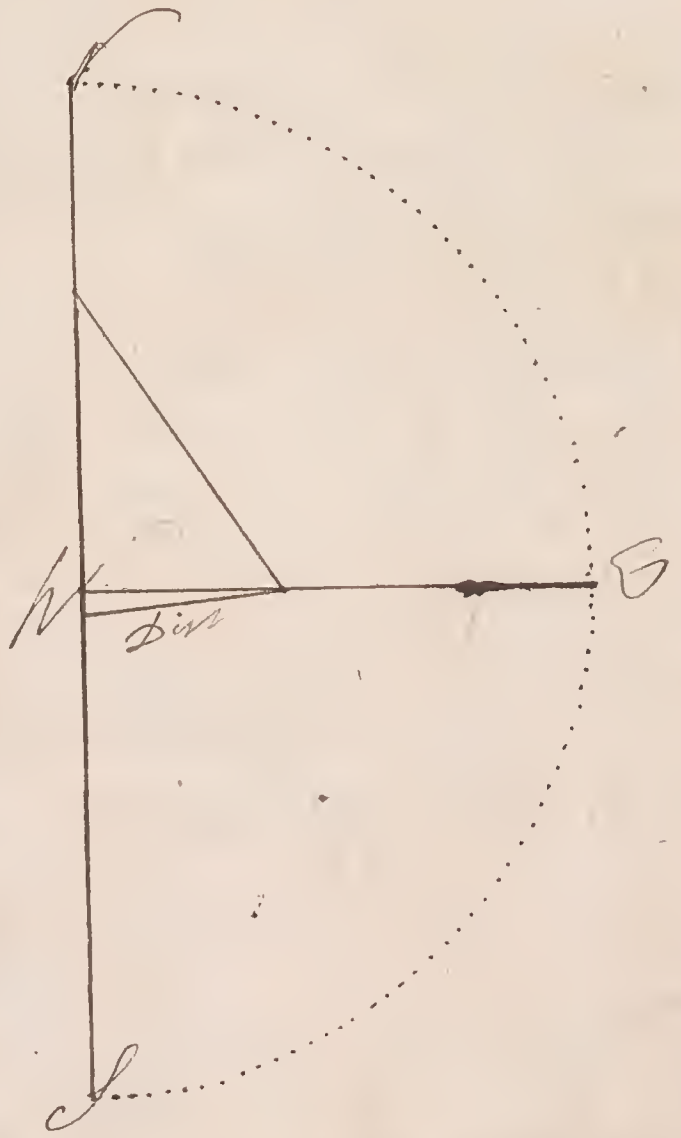
Lat in 57°07 N
Whitby Lat 54°29 N
M Lat 111°66
55°48
90°00
C M Lat 34°12

as S C M Lat ----- 34°12 --- 2.974998.01
Is to the Dep^t ----- 108.9 --- 2.037028
So is Radius ----- 90°00 --- 10
To the ex of Long^t ---- 193.8 2.287227

as Radius ----- 90.00 --- 10
Is to the ex of Long^t --- 476 --- 2.677607
So is S C M Lat^d --- 34°12 --- 9.749801
To the Dep^t ----- 267.6 -- 2.427408

as the ex of Lat^d ---- 28 --- 1.061728
Is to Radius ----- 90.00 --- 10
So is the Dep^t ---- 267.6 -- 2.427408
To the T Course ---- 86°05 -- 11.065680
S C Course 24°55

as S C Course --- 24°55 --- 9.930015
Is to the ex of Lat^d --- 28 ----- 1.861728
So is Radius ---- 90°00 --- 10
To the Dist ----- 267.7 -- 2.427715



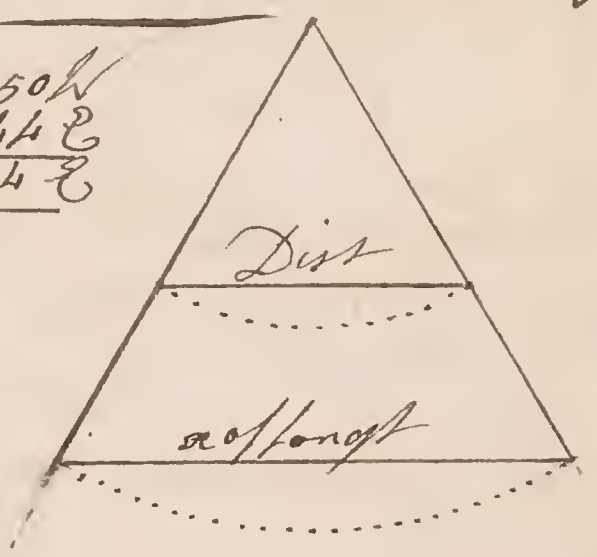
Parallel Sailing. 1759

A ship from Whitby Sails 200 Miles Due East — demand her Longitude in

Whitby Lat 54°-30 N
Dep 200°00
C Lat 35°30

Whitby Long 00°-50 W
x of Long 05°-44 E
Long in 4°-54 E

as C Lat ..... 35°30 ..... 9.763954
So to the Dist ..... 200 ..... 2.301030
So is Radius ..... 90°-00 10
To the x of Long Co 54.4/4 ..... 2.537086
30 0/5
44

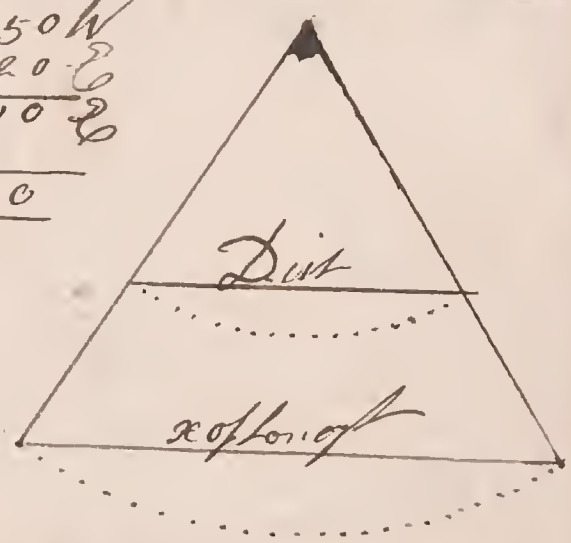


A Ship from Whitby Sails due East till she arrive in Long. 6°-20 East — demand her Distance run

Whitby Lat 54°-30 N
Dep 20°00
C Lat 35°30

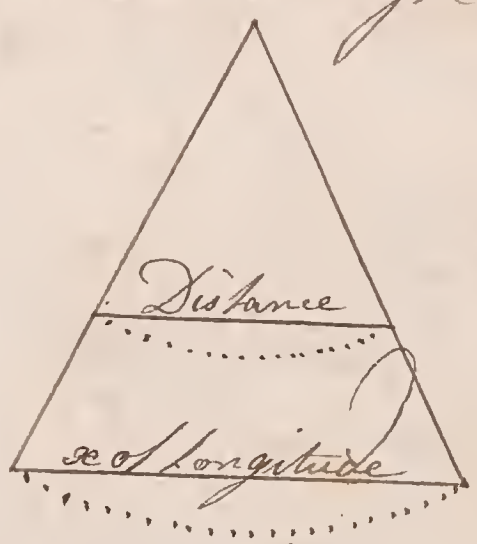
Whitby Long 00°-50 W
Long in 06°-20 E
x of Long 7°10 E
60
430

as Radius ..... 90°-00 10
So the x of Long ..... 430 ..... 2.633468
So is C Lat ..... 35°-50 ..... 9.763954
To the Distance ..... 249.7 ..... 2.397422



In what Lat. does 37 Miles make a Degree of Longitude

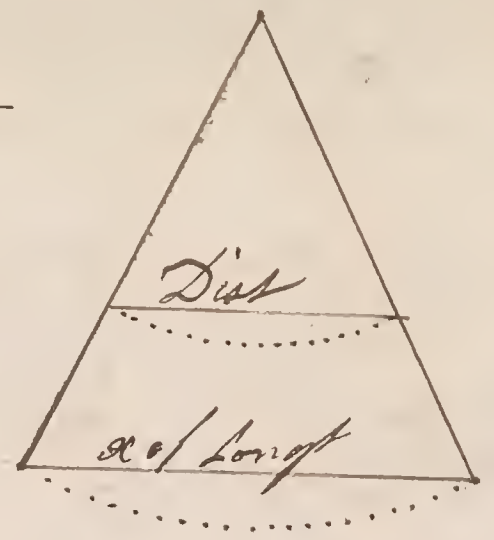
as the x of Long ..... 60 ..... 1.778151
So is Radius ..... 90°-00 10
So is the Dist ..... 37 ..... 1.568202
To C Lat ..... 38°-05 ..... 9.790051
Lat in 90°-00
51°-55



How many Miles make a Degree of Longt. in the Latitude of London

51°.31
90°.00
38°.29

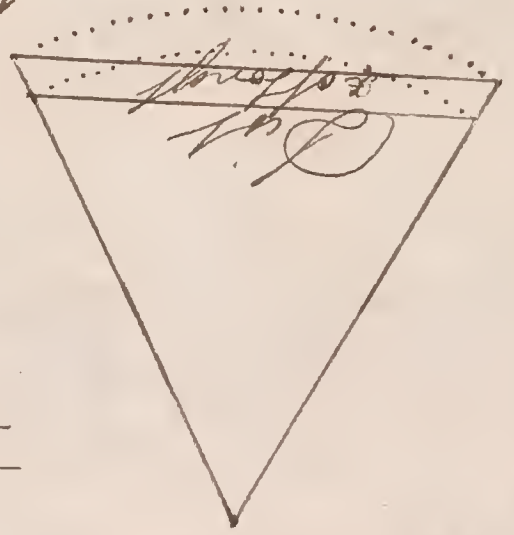
as Radius ---------- 90°.00 --- 10
So is the ∝ of Longt --- 60 ------ 1.7786151
So is S C Lat --------- 38°.29 - 9.7933991
To the Distance -- 37.56 1.5721142



Two Ships under the Equator distant 640 Miles sail both of them 1320 Miles due South I demand their distance asunder

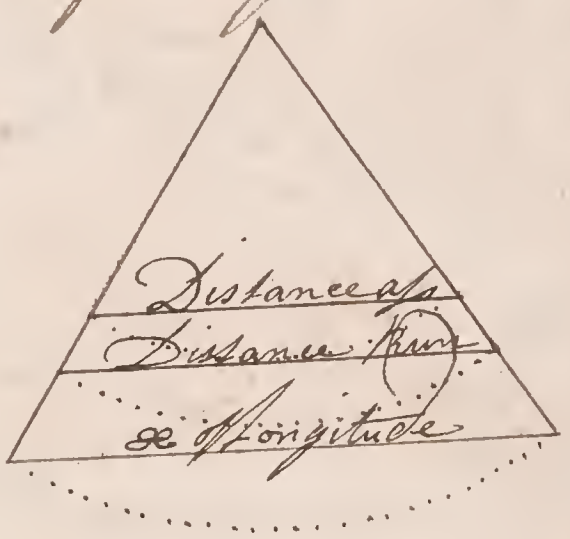
as Radius ---------- 90°.00 ---- 10
So is the Distance ------ 640 ------ 2.8061800
So is S C Lat ---------- 68°.00 --- 2.9671666
To the Distance asunder --- 590.4 -- 2.7733466

90°.00
60)1320(22°.00
120 66°.00
120
120



Two Ships in Lat. 37°.20 North distant 570 Miles sail both of them 678 Miles due North I demand their distance asunder Latitude in and Diff of Longt.

as S C Lat ------ 52°.40 ------ 9.9004183
So is Distance --- 570 ------ 2.7558675
So is Radius ---- 90°.00 ---- 10
To the ∝ of Long --- 716.9 -- 2.8554442



as Radius ---------- 90°.00 --- 10
So is the ∝ of Long ---- 716.9 ------ 2.8554442
So is S C Lat.d ---- 41°.22 --- 9.8201200
To the Distance --- 465.1 --- 2.6755642

60)678(11
60
78
60
18

Lattd in 37°.20
C Lagd 52°.40
Lattd in 37°.20
a of Lagd 11°.18
Lattd in 46°.38

60)717(11 C Lagd 90°.00
60 41°.22
117
60
57

Answer their Distance assumed is 465.1 Miles
Lattd in 46°.38 ∝ of Longt 11°.57

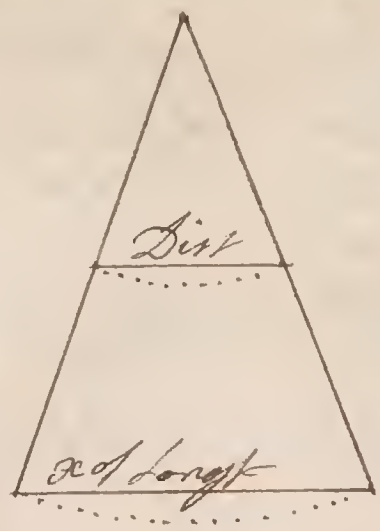
A Ship from Whitby sails first 200 Miles due North & then 150 Miles due East I demand her Latitude and Long.de in

as S C Latt ---- 32°11 ---- 9.726426
I to the Dist ---- 150 ---- 2.176091
I to is Radius ---- 90°00 ---- 10
I to the ∝ of Long.de ---- 261.6 ---- 2.414,9665

60/200/3.20
180/54"29
2°57'49 Latt in

60/262/04"42 E
240/00'50 W
4h 0' 52 E Long.de in

C Latt 32°11
90°00



A Ship from Whitby sails first 200 Miles due East and then 150 Miles due North I demand her Latitude and Long.de in

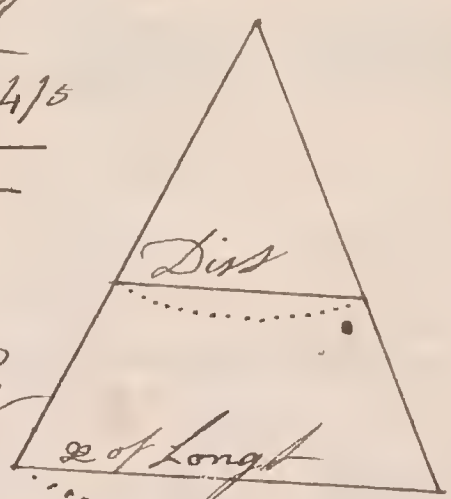
as S C Latt ---- 55°30 ---- 9.763954
I to the Dist ---- 200 ---- 2.301030
I to Radius ---- 90°00 ---- 10
I to the ∝ of Long.de ---- 84h4' ---- 2.537076

60/84'4/5
30°
4 4

60/150/2.30 ∝ of Lat N
120/54'29 Long.de from N
30'56'30 Lat in C Lat 55°30

54"29
90°00
35°30

∝ of Long.de 05'44" E
Long.de from 00"50 W
Long.de in 4"54 E



A Ship from the Lizard sails 300 Miles due West then 400 miles due South and then 500 Miles due West I demand her Lat.de & Long.de in

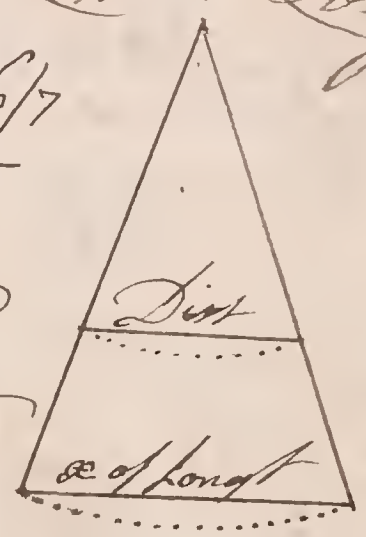
as S C Latt ~~from~~ 60°05 ---- 9.806519
I to the Dist ---- 300 ---- 2.477121
I to Radius ---- 90°00 ---- 10
I to the ∝ of Long.de ---- 166.3 ---- 2.664602

6/466/7
42 6/7
46

60/400/6.40 ∝ of Lat S
360/49"57
40/42"17
C Lat 20°00
C Lat 27.43

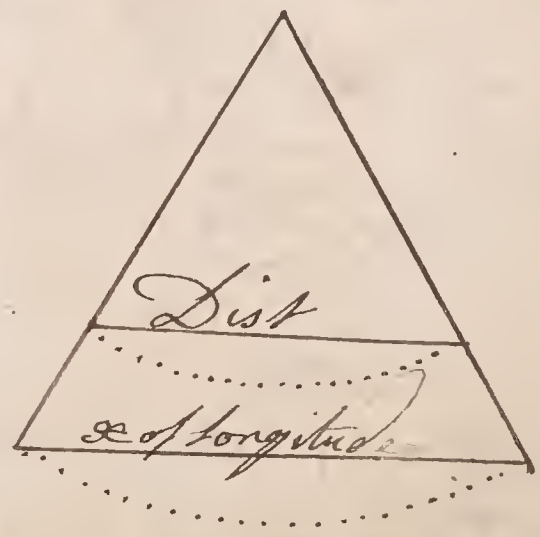
49"57
90"00
40°03 C Lat

Lat from N
∝ of Long.de from 05"14 W
Long.de 07"46 W
Long.de in 13"00 W



as S C Latt ---- 47°45 ---- 9.869180
I to the Dist ---- 500 ---- 2.698970
I to Radius ---- 90°00 ---- 10
I to the ∝ of Long.de ---- 675.6 ---- 2.826,8150

60/676/11"16 ∝ of Long.de W
60/18"00 Long.de from W
96'24"16 Long.de in W
60
16



A Ship from West Denmark for Placentia Bay in Newfoundland sails 1200 Miles due West I demand her Longd. in & also the Bearing & Distance of Placentia Bay

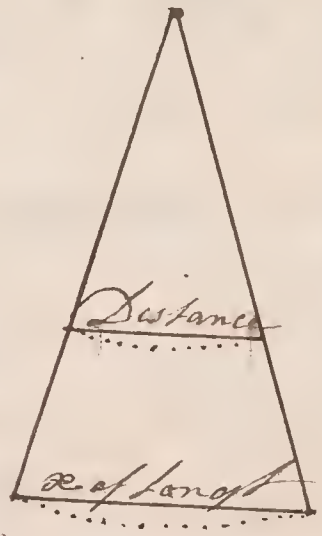
As S C Latt° ---------- 42°12 ---------- 9.827169
S to the Dist ---------- 1200 ---------- 3.079161
as Radius ---------- 90°00 ---- 10
S to the ∝ of Long ---- 60°17′6 ---- 3.251992

90°00
47°48
C Lat 42°12

120 — 2 9°46 ∝ of Long W
5′6 — 0 4°24 Long from W
5′0 — 34°10 Long in W
16 — 53°56 Placentia Long W
60 — 19°46 ∝ of Long
11′6

as Radius ---------- 90°00 ---- 10
S to the ∝ of Long ---- 11′6 ---- 3.074616
as C is S C Latt° ---------- 42°12 ---- 9.827169
S to the Distance ---- 79′6 ---- 2.902007

Answer her Longitude in is 34°10 W Placentia Bay
Bears West Distance 79′6 miles



A Ship from the Lizard for Guardaloup Sails due West till she arrive in Long. 25° West & then due South till she arrive in the Latt. of Guardaloup I demand her whole Distance run this also the Bearing and Distance of Guardaloup

as Radius ---------- 90°00 ---- 10
S to the ∝ of Long ---- 11′66 ---- 3.074065
S as S C Latt ---------- 40°03 ---- 9.806519
S to the Distance ---- 7632 ---- 2.882604
2027
2190.2

49°57
90°00
C Lat 40°03

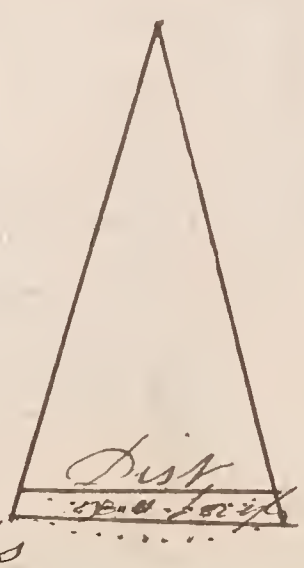
as Radius ---------- 90°00 ---- 10
S to the ∝ of Long ---- 2175 ---- 9.337459
as C Lat ---------- 73°50 ---- 9.962477
S to the Dist ---- 2069 ---- 9.319936

Lizard Long 05°14′W
Long in 25°00W
19°46
60
∝ of Long 1186

Lizard Latt 49°57N
Gar Latt 16°10N
33°47
60
2027

Long in 25°00W
Gar Long 61°15W
36°15
60
2175

Gardaloupe Latt 16°10N
C Latt 20°00
73°50



Answer her whole Distance Runs is 2190.2 Miles
the Bearing of Gardaloupe is West Dist 2069 miles

To find the Latitude by an Observati.

The Suns Declination is his Distance from the Equinoctial and may be either N.° or S.° The Zenith Distance is the Suns Distance from the point directly over your head and is always equal to the Complement of the Altitude. If the Zenith Distance and Suns Declination be of Different Denominations their Sum is the Latitude of the place but if they be of the same Denominations their Difference is the Latitude of the Place.

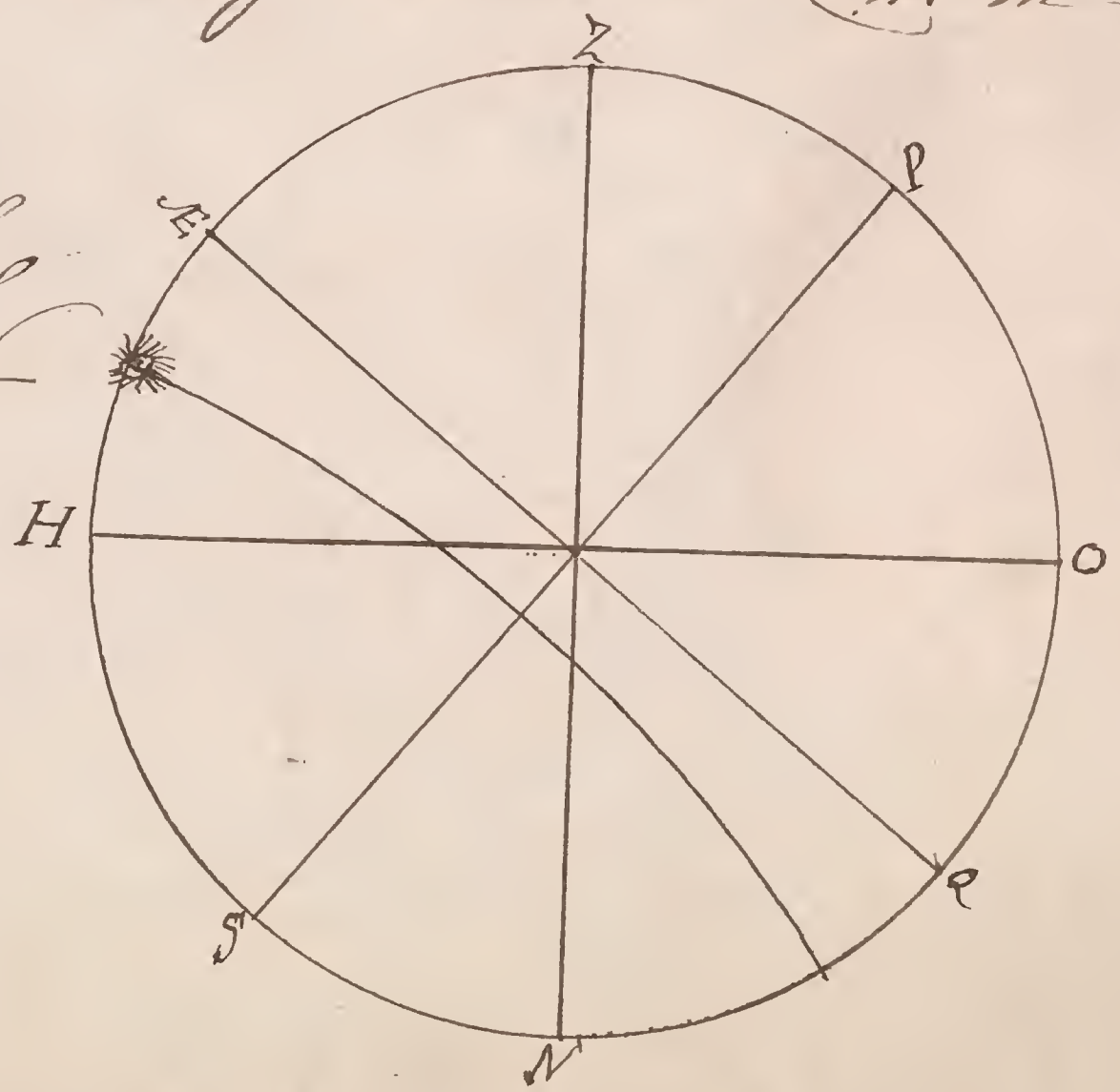
The Latitude is always of a Contrary Name to the Zenith Distance unless the Declinat.ion be of the same name with and exceed the Zenith Distance.

When you observe by Hadleys Quadrant you must add 13 in the Fore Observation and Subtract 19 in the back Observation; the Sum or Difference is the Suns Meridian Altitude; which being Subtracted from 90° gives the Suns Zenith Distance with which you are to work as is directed above.

Nov.r 10.th 1759 the Sun's Zenith Distance at Noon being 68°: 30' South I demand the Lat.de in ——

90°,,00
17°: 11
72°: 49

Suns Decl.n 17°: 11' S
Zenith Dist 68°: 30' S
Latt.e in 50°,,19' N



How to Project the Figure

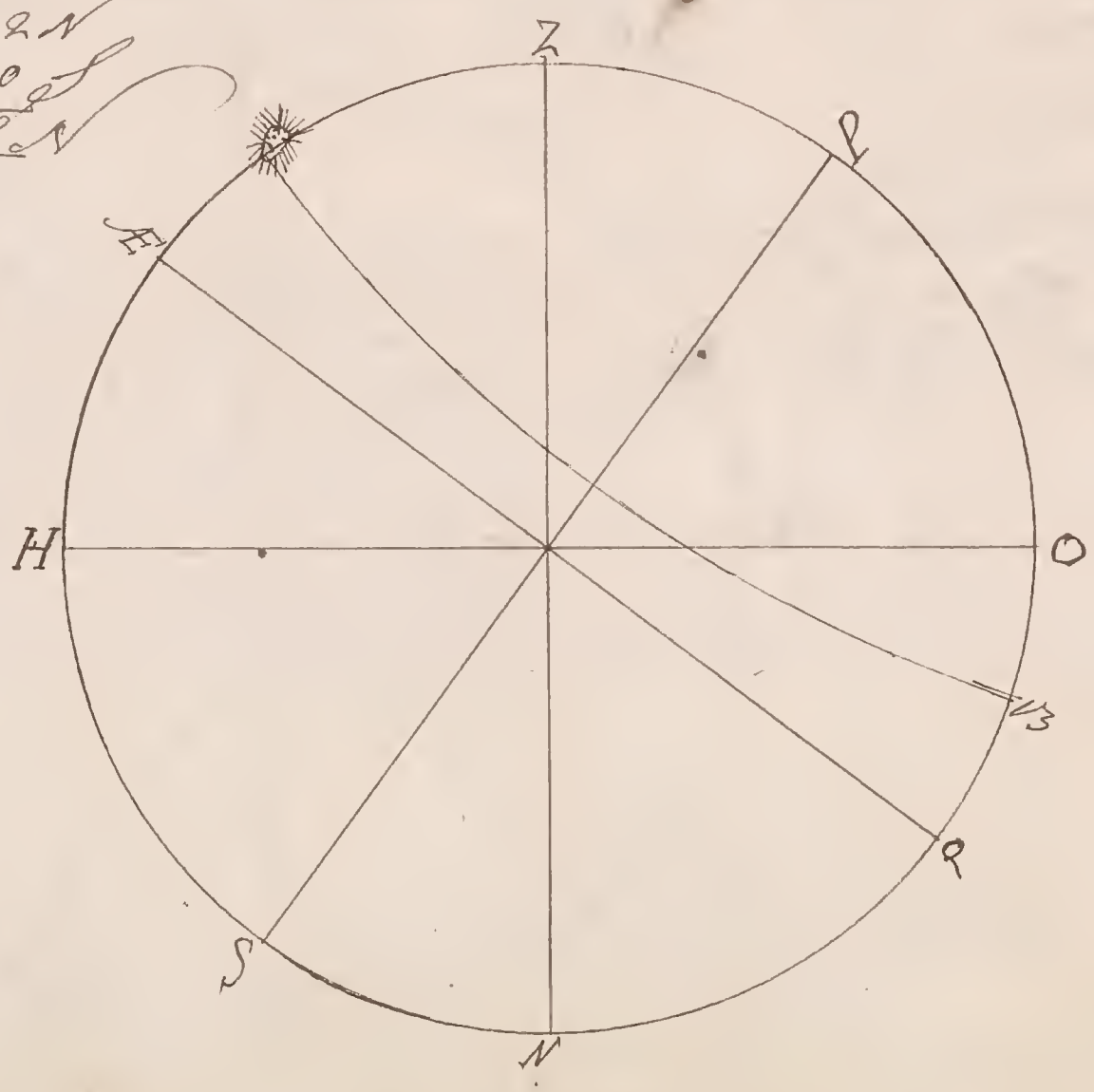
The Primitive Circle being drawn and quarter'd H O represents the Horizon and Z N the Prime Vertical, or East and West Line; Z being the Zenith or Point right over your Head: and N the Nadir or Point directly under your Feet; H being the most Southerly Point, and O the most Northerly Point in the Projection. From Z set off the Zenith Distance according to its Name to ☉; From which set off the Declination, always contrary to its Name, to Æ; From whence a Line Æ Q being drawn thro the Center will be; the Equinoctial; and having drawn P S at right Angles thereto it will represent the Poles of the World; P being the North Pole, and S the South Pole. then with the Tangent Complement of the Declination sweep the parallel Circle ☉ ♑ for the Path of the Suns way that Day and the figure is Compleated.

The Latitude of the Place is always equal to the Height of the Pole above the Horizon; and is North if you measure from O to P, but South if you measure from H to S. ——

May 15th. 1760 the Sun's Zenith Distance at Noon being 34° 40' South I demand the Latitude in ——

Dist 90° 00'
Decl 19° 02'
70° 58'

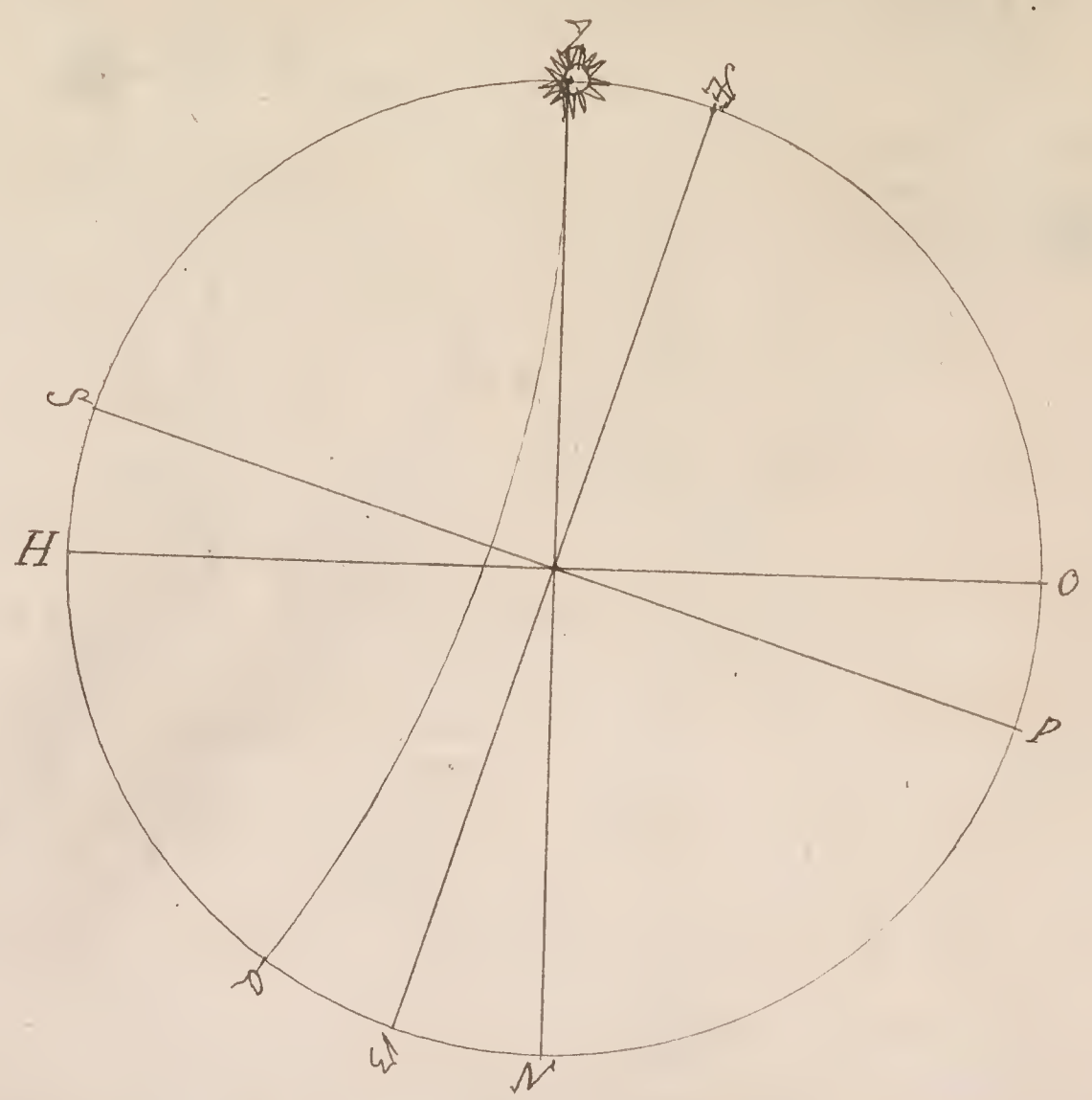
Suns Declination 19° 02' N
Zenith Dist 34° 80' S
Lat in 53° 32' N



Nov.r 12.th 1759 the Sun's Zenith Distance at Noon being 0°:00′ I demand the Latitude in ——

90°.00′
17°.44′
72°.16′

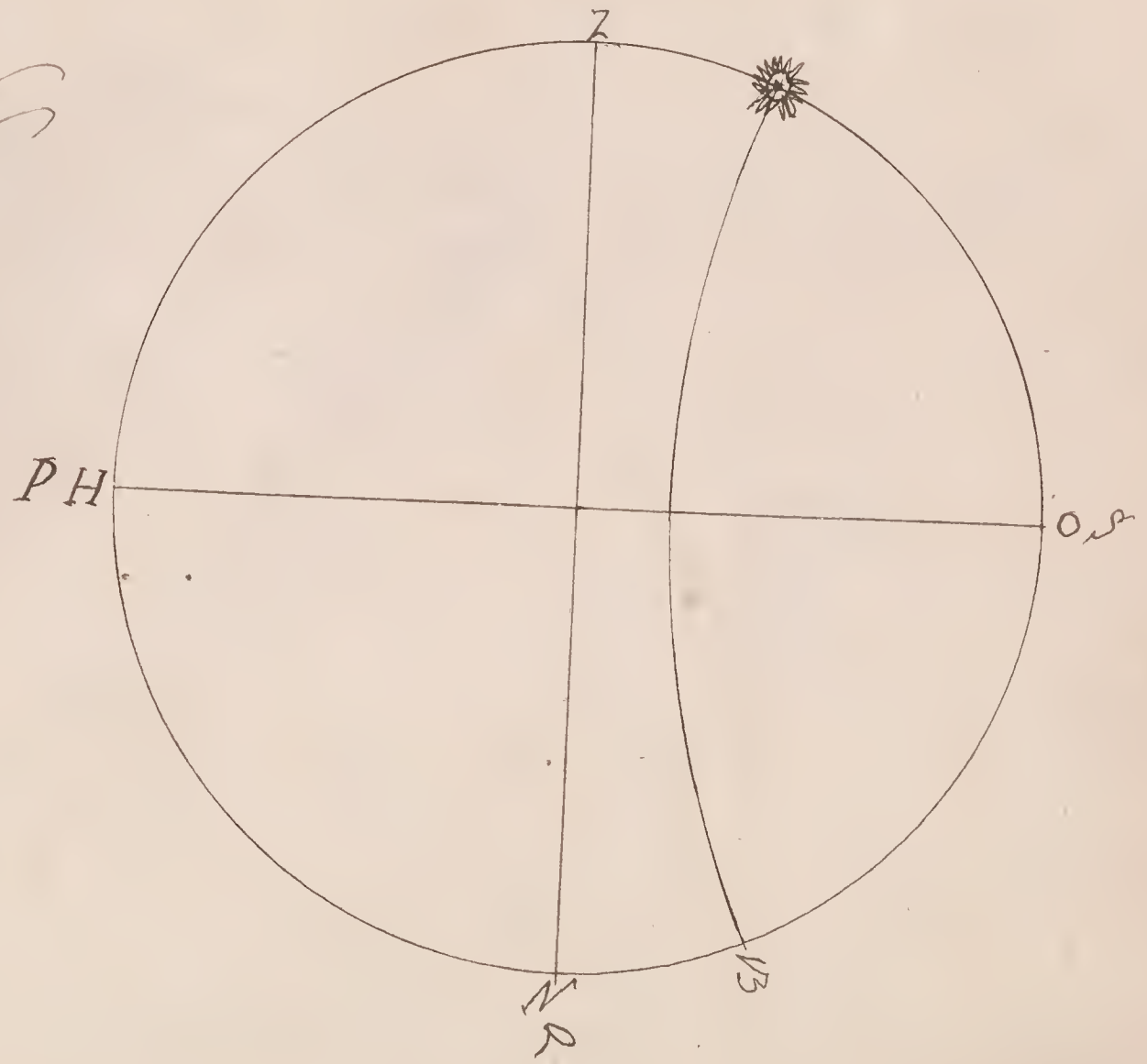
Suns Declt 17°.44′ S
Zenith Dist 00°.00′
Lattd in 17°.44′ S°



June 22.d 1760 the Sun's Zenith Distance at Noon being 23°:29′ North I demand the Latitude in ——

90°.00′
23°.29′
66°.31′

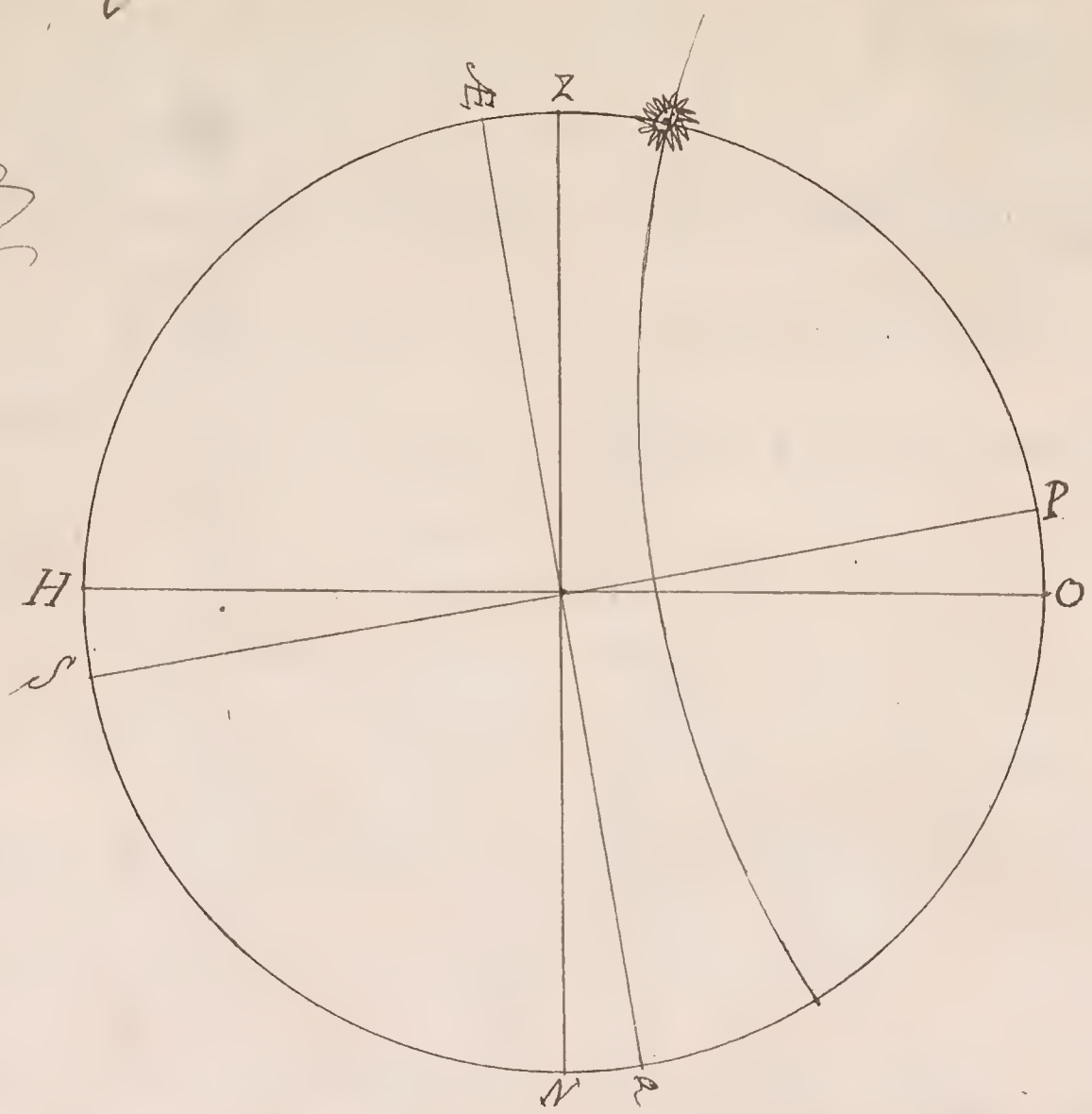
Suns Declt 23°.29′ N
Zenith Dist 23°.29′ N
Lattd in 00°.00′



July 4th 1760 the Sun's Zenith Distance at Noon be-
ing 12°:40' North I demand the Latitude in -

90°00'
22°52
67°08

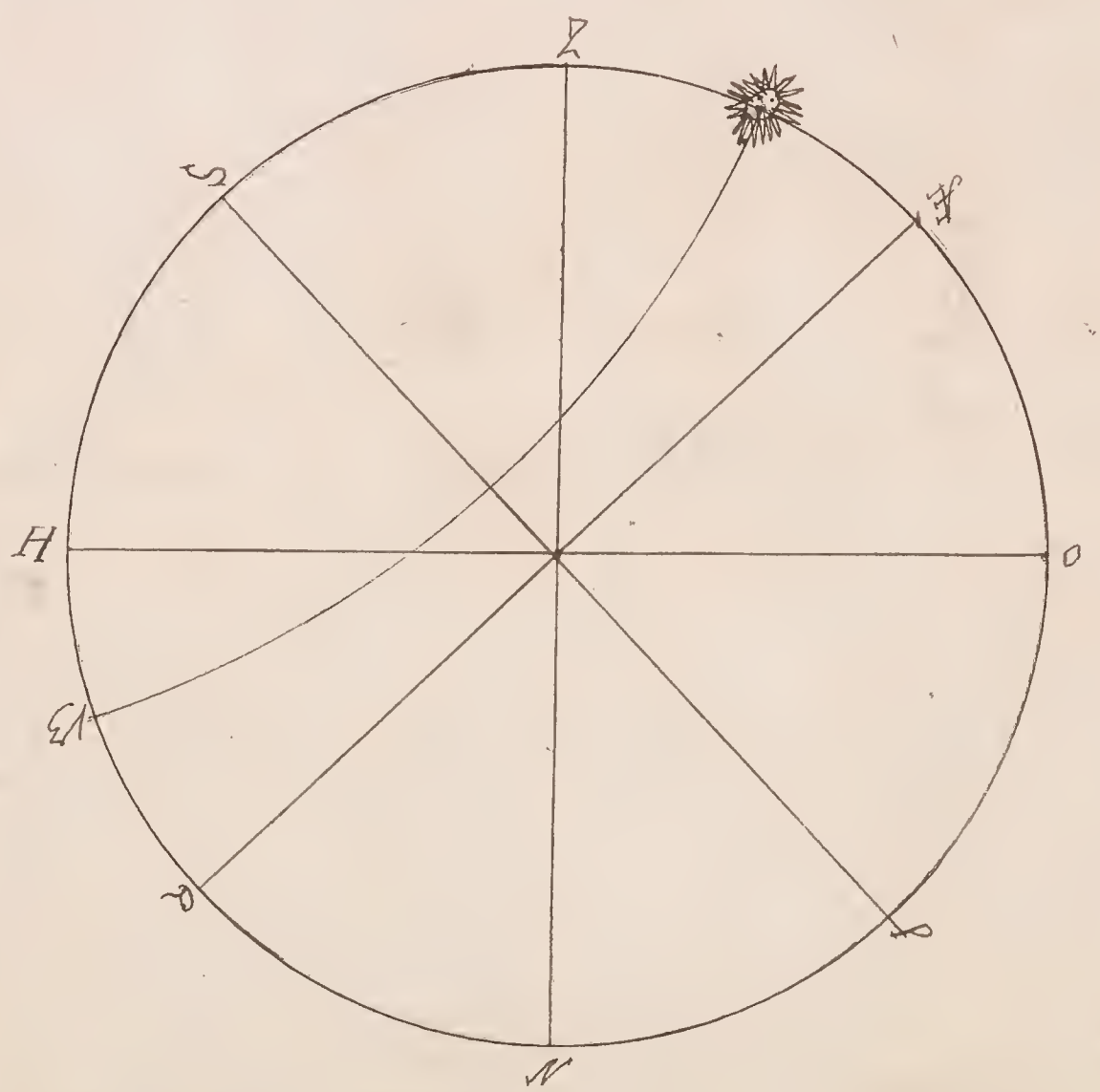
Suns Declt 22°52 N
Zenith Dist 12°40 N
Latitude in 10°12 N



Jan.y 1, 1760 the Sun's Zenith Distance at Noon be-
ing 23°:50' North I demand the Lat.e in -

90°00
23°03
66°57

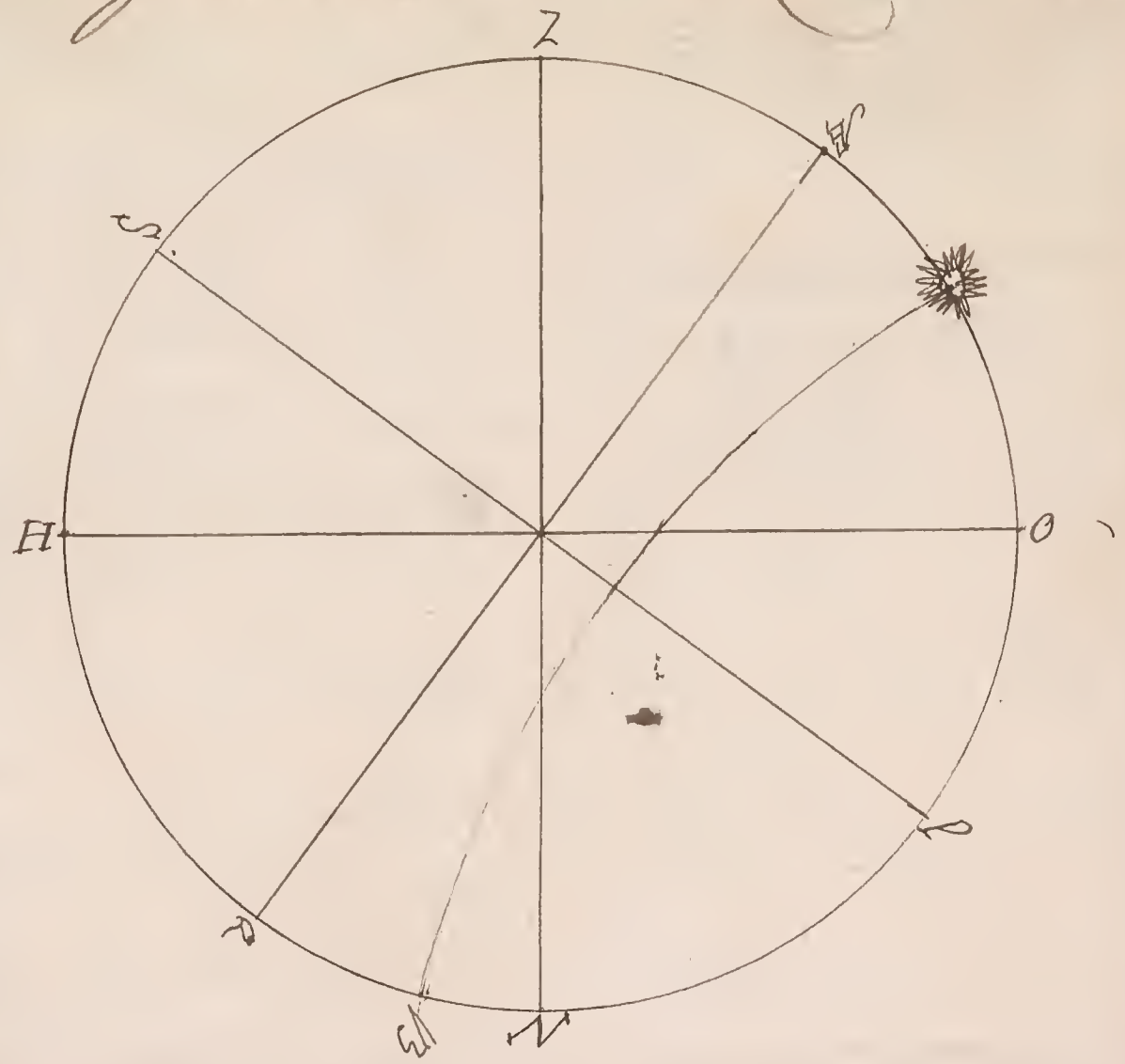
Suns Declt 23°03 S
Zenith Dist 23°50 N
Latitude in 46°53 N



June 4th 1760 the Sun's Zenith Distance at Noon being 56°:20 North I demand the Lat.e in

90°00
22°32
67°28

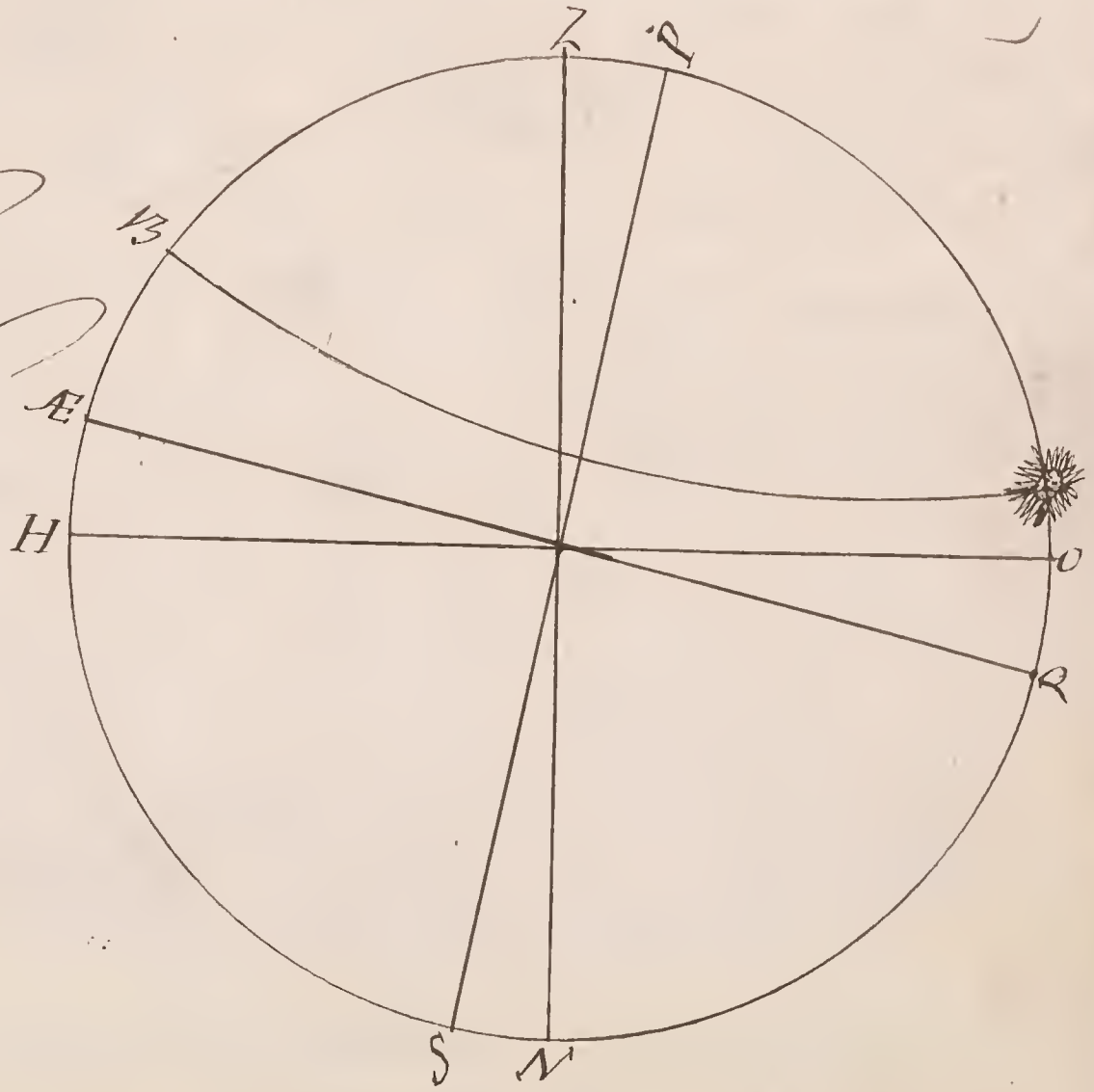
Suns Declin.t 22°.32 N
Zenith Dist.e 56°.20 N
Lat.de in 33°.48 S



June 3d 1760 the Sun's Zenith Distance at Midnight &c. being 83°:40 North I demand the Latitude in

90°00
22°25
67°35

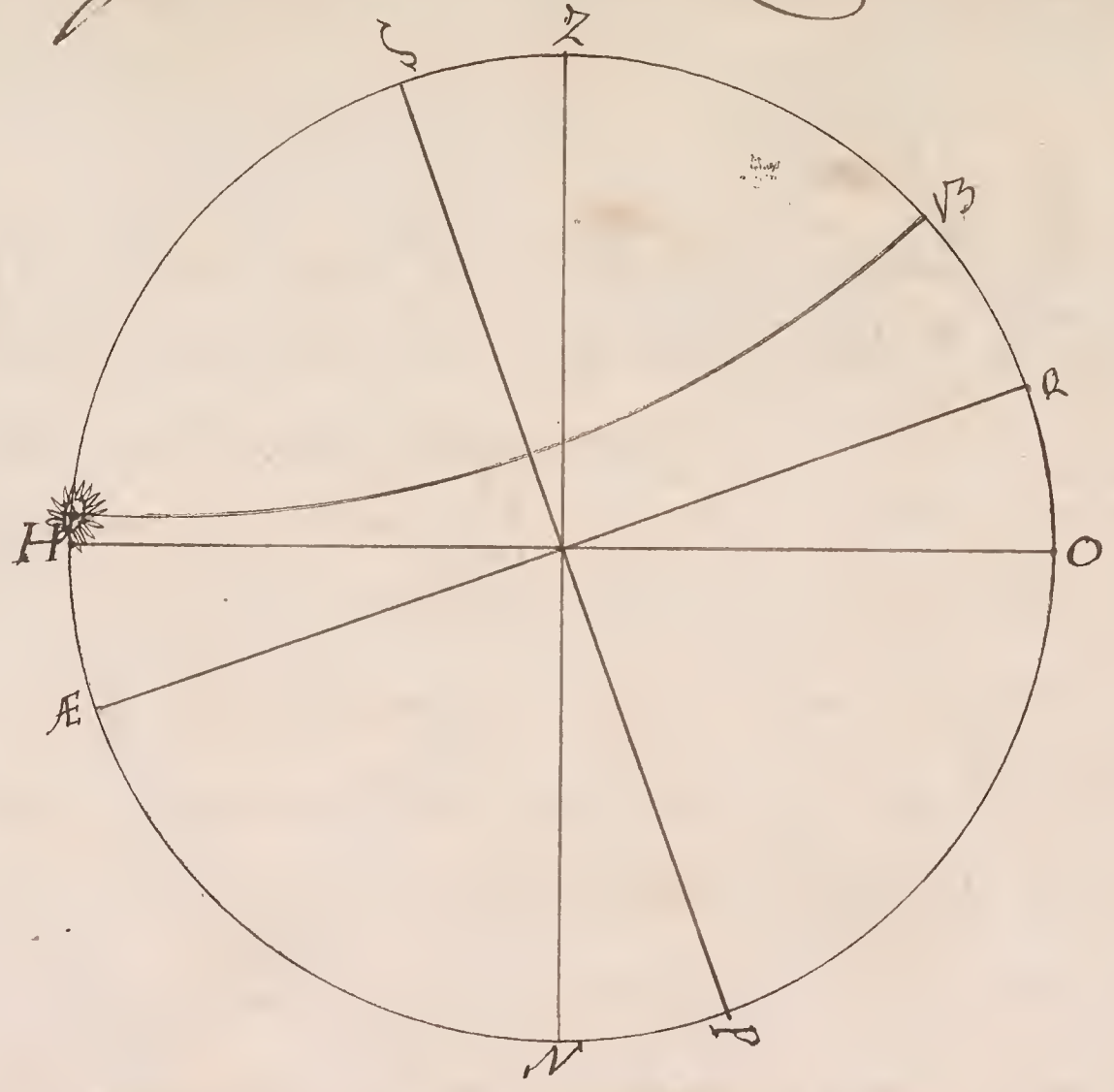
Suns Declination 22°.25 N
Zenith Distance 68°.40 N
106°.05
180°00
Latitude in 73°.55 N



Dec.r 25.th 1759 the Sun's Zenith Distance at Midnight being 87° : 20' South I demand the Lat.de in

90°00
23°26
66°34

☉ Suns Declination 23°26' S
Zenith Dist 87°20 S
110°46
Latitude in 180°00
69°14 S

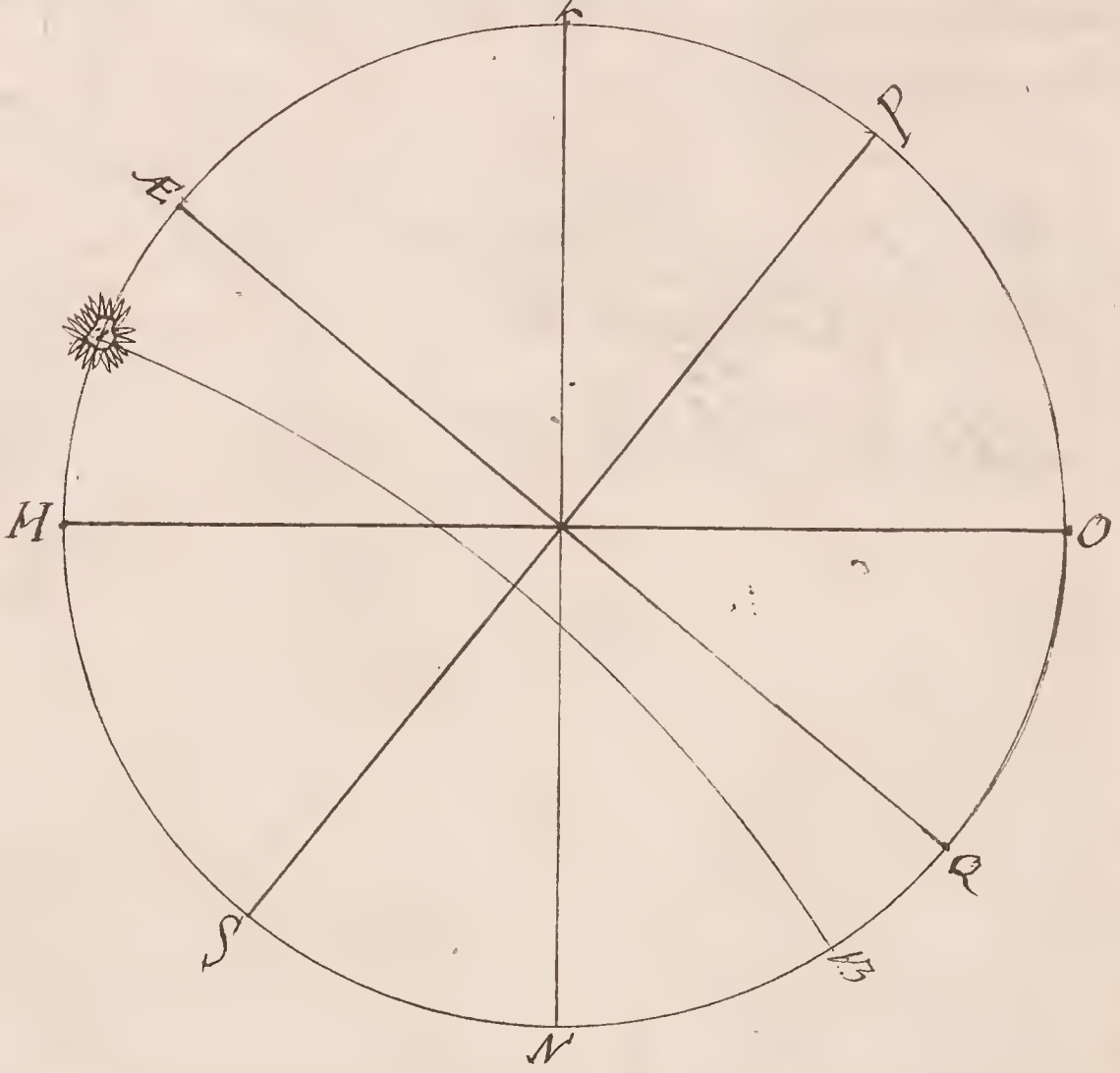


Nov.r 13.th 1759 the Sun's Meridian alt.e by a fore observation of Hadley's Quadrant being 21° : 20 South I demand the Lat.de in

21°20
13
21°33
90°00
Zenith 68°27 Dist.ce S

90°00
18°00
72°00

☉ Suns Declination 18°00 S
Zenith Distance 68°27 S
Latitude in 50°27 N



To correct by an Observation 1759

The Errors in a Journal are generally owing to one of these three following Causes 1 a Current 2 a mistake in the Course or 3 an Error in the Distance — If the Latitude by Observation differ above 30 miles from the Latitude by account we Conclude there is an Error in the Journal; To rectify which, you are first of all to Consider if there have been a Sea or a Current Setting with or against you and try if the making proper allowances for that will not bring your Journal to rights. But if you are not sensible of, or cannot perceive any thing of this kind, you are next carefully to examine whether allowances hath been made for Variation and Leeway, and to see if your Course be not faulty But if here also you are not sensible of any mistake committed you are last of all to Correct by Supposing an Error in the Distance ——

When a Ship Sails within 3 points of the meridian it is usual among Navigators to correct by Supposing an Error in the Distance: But on the contrary when she Sails within 3 points of an East or West Line they generally correct by Supposing an Error in the Course — If a Ship Sails more than 3 points from the Meridian, and yet not within 3 points of an East or West Line find the Dist by the Log; and by that and your correct Difference of Latitude find a new Departure; add this and your Departure by the Log together and the half of their Sum will be the Correct Departure; by which and the Corect Latitude the true Difference of Longitude is easily found ——

A ship from Ushant Sails by the Log till she arrive in Latd 45°:40 North & Longd 18°:25 West when she is by observation in Latd 45°:05 North I demand her correct Course Departure and Longitude in

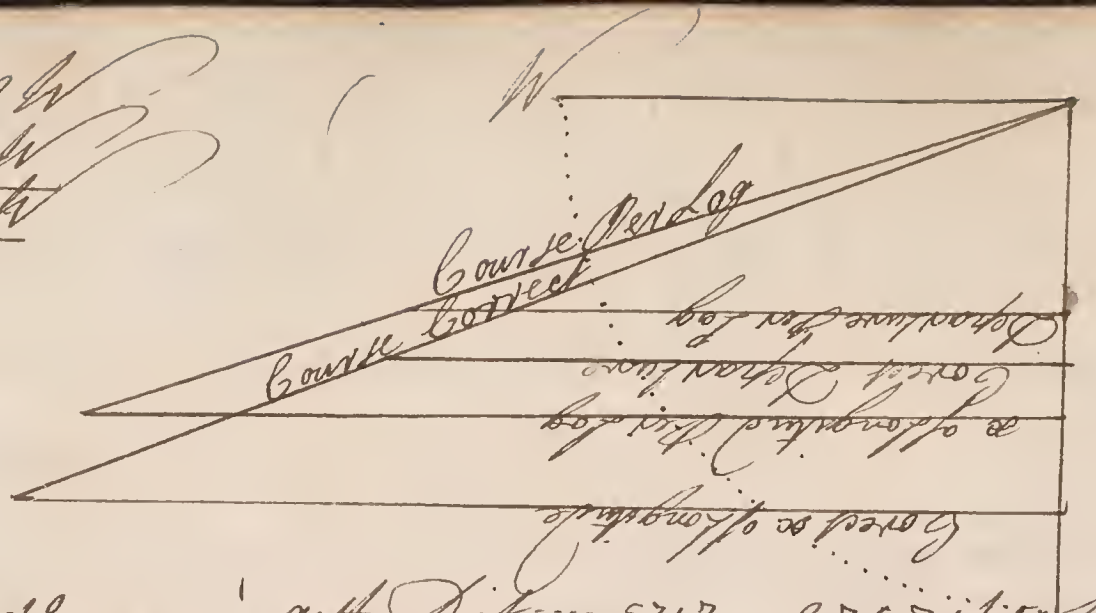
Ushant Latd 46°.30 N 3337 Ushant Long 5°.02 W Lat obs 45°.05 N 3537
Latd per log 45°.40 N 3087 Long per log 18°.25 W Latd from 46°.30 N 3307

2'.50 | 250 M ex of Lat — 13'.23 — 3'.25 | M 320 ex Lat
60 60 60
ex of Lat 170 ex of long 803 ex of Lat 205

as M ex of Lat ---- 250 --- 2.397940 as SC Course 17°.18 --- 9.479330
To Radius ---- 90°.00 -10 To the ex of long 170 --- 2.230449
So is the ex of long --- 803 --- 2.904715 So is Radius --- 90°.00 -10
To the Course 72°.42 10.506775 To the Dist 5767 3.757145
17°.18

Obsvd Long 05°02 W
Cor of Long 13°53 W
Long in 18°55 W

60/693/13
60
233
180
53



As Radius ------ 90°00 --- 10
So to the Dist --- 571.7 ---- 2.757145
So is S Course -- 72°42 -- 9.979695
So to the Dept'd 545.8 2.736840

As Radius ---- 90°00 --- 10
So to the Dist 571.7 -- 2.757145
So is S Course 66°59 -- 9.960163
So to the Dept' 523.6 2.717308
545.8
√10224
598.2

As the Dist ---- 571.7 --- 2.757145
So to Radius --- 90°00 --- 10
So to the Cor of Lat Cor 205 -- 2.311764
So to the S Course 21°01 9.551609
66°59

As S Course --- 21°01 --- 9.551609
So to the Cor of Lat 320 --- 2.505150
So is S Course 66°59 --- 9.970108
12.026867
So to the Cor of Long 2.926642

By the Log	Courses	Dist	Cor of Latitude N	Cor of Latitude S	Departure E	Departure W	Latitude in	Cor of Long	Longitude in	
	WNW½W	517.7	170			545.8	45°40	13°23	18°25	West
Corrected	WNW	517.7	205			523.6	46°90	13°53	18°55	West

A Ship from Cape Clear Sails by the Log till she arrive in Lat. 40°:20 North & Long. 14°:10 West when she is by observation in Lat. 39°:35 North I demand her correct Distance Departure and Longitudes in

C Clear Lat 51°17 N 3596 C Clear Long 11°10 W Lat Obs 39°35 N 2590
Lat Per Log 40°20 N 2649 Long per Log 14°10 W C Clear Lat 51°17 N 3596
10°57 947 3°00 11°42 1006 M Cor of Lat
Cor of Lat 657 Cor of Long 60 1460 60 702
Cor of Lat Obs 702
Cape Clear Long 11°10 W
Cor of Long 03°11 W
Long in 14°21 W

60/191/3
180
11

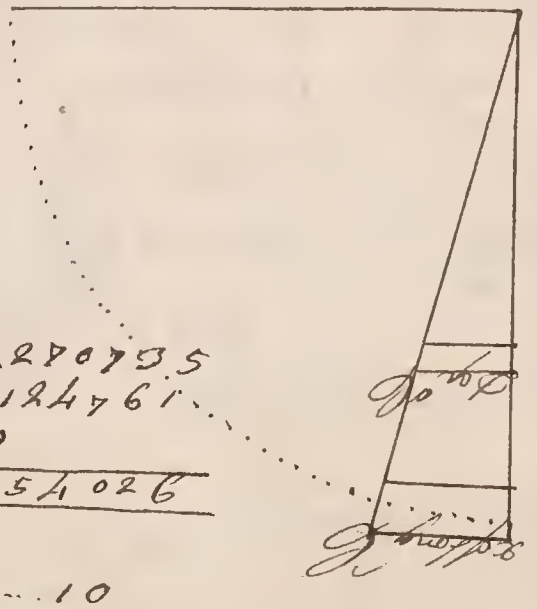
As M Cor of Lat --- 947 --- 2.976050
So to Radius ------ 90°00 --- 10
So is the Cor of Long --- 1460 --- 2.255272
So to the S Course 10°45 9.276922
79°15

As S C Course --- 79°15 --- 9.992311
So to the Cor of Lat --- 657 --- 2.817565
So is Radius --- 90°00 --- 10
So to the Dist ------ 6647 --- 2.825254

As S C Course 79°15 --- 9.992311
So to the Cor of Lat 702 --- 2.846097
So is S Course 10°45 --- 9.270735
12.111707
So to the Dept' 1033 2.124761

As S Course 79°15 --- 9.992311
So to M Cor of Lat 1006 --- 3.002596
So is S Course 10°45 --- 9.270735
12.265642
So to the Cor of Long 1906 2.273331

As S Course 10°54 --- 9.270735
So to the Dept' 1033 --- 3.124761
So is Radius 90°00 10
So to the Dist 567 2.754026



As Radius --- 90°00 --- 10
So to the Dist 1664.7 --- 3.825254
So is S Course 10°45 --- 9.270735
2.095989
So to the Dept' 1247

	Course	Dist	ae of Latitude N	S	Departure E	W	Latd in North	ae of Long E	Long in E
By the Log	SBE	66.7	65.7			12.7	40″20	03″00	14″10
Corrected	SBW	56.7	70.2			13.3	39″35	03″11	14″21

A Ship from Kingsale sailo by the Log till she arrive in Latd. 40°: 40 North & Longd. 22°: 30 West when their by observation in Latd. 40° North I demand her course

Course Departure Distance

Kingsale Latd 51°50 N 3649
Latd per Log 40″40 N 2675
11″10 974
60
670

Kingsale Long 09″40 W
Long per Log 22″30 W
12″50
60
770

Kingsal Latd 51″50 N 3649
Latd per Obs 40″00 N 2623
11″50 1026
60
710

Kingsal Long 09″40 W
ae of Long 12″05 E
Long in 21″45 W

As ae of Latd ---- 974 ---- 2.9885591
To to Radius ---- 90″00 ---- 10
So the ae of Long ---- 770 ---- 2.8864391
To the Course 38″19 9.8097832
51″41

As Course ---- 51″41 ---- 9.8946461
To the ae of Latd ---- 670 ---- 2.8270751
So is Radius ---- 90″00 ---- 10
To the Dist ---- 654 ---- 2.9314291

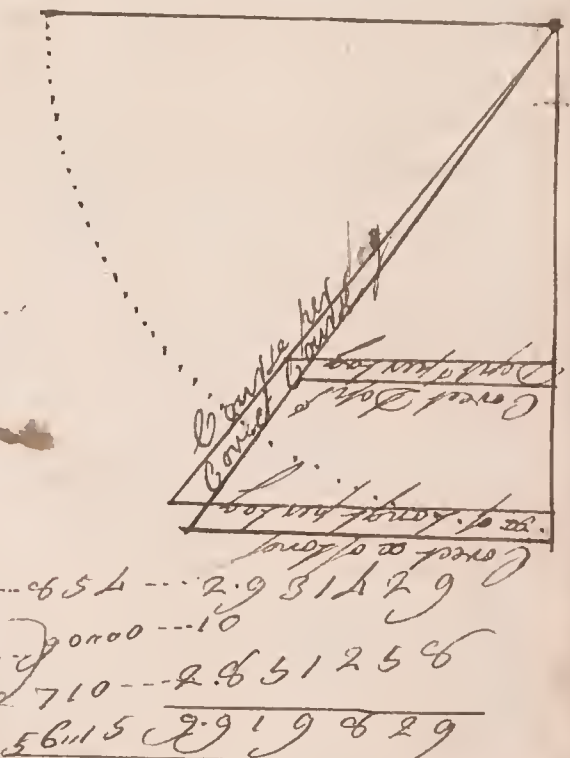
As Radius 90″00 ---- 10
To the Dist ---- 654 ---- 2.9314291
So is Course 38″19 9.7923997
To the Dept 529.5 2.7238626

As Radius 90″00 ---- 10
To the Dist 652 ---- 2.9014291
So is Course 33″45 9.7447891
To the Dept 2.7761686

474.4
529.5
1003.9
501.9

As m ae of Latd 1206 ---- 3.0811147
To to Radius 90″00 ---- 10
So is the ae of Long 725.3 2.8606506
To the Course 35″15 9.8649959
54″45

6)725/12
60
125
120
5



As the Dist ---- 654 ---- 2.9314291
To to Radius ---- 90″00 ---- 10
So is the ae of Latd 710 ---- 2.8512586
To S Course 56″15 2.9198629
33″45

As prop ae of Latd 710 ---- 2.8512586
To M ae of Latd 1026 ---- 3.0111147
So is the Dept 501.9 2.7006117
To the ae of Long 725.3 5.7117765
2.8605066

As S Course 56″12 ---- 9.9120031
To the ae of Latd 710 ---- 2.8512586
So is Radius 90″00 ---- 10
To the Dist 639.4 2.9992227

By	Course	Dist	ae of Latitude N	S	Departure E	W	Latd in	ae of Long	Long in
the Log	SWBS½W	654	670			529.5	40″40	12″50	22″30 W
Corrected	SWBS½W	639.4	710			501.9	40″00	12″05	21″45 W

A Ship from the Lizard Sails by the Log in a Current setting S8E till she arrive in Latd. 37°:50 North & Longt. 22°:40 West when she is by observation in Latd. 33°:20 North 7 dem. per Correct Course Departure Distance & Longt. in

Lizard Lat 49°:57 N 0470 Lizard Long 05°:14 W Lizard Lat 60°:20 N 2120
Land Lat 37°:50 N 2456 Long Log 22°:40 W Lizard Lat 49°:57 N 0470
12°:07 1026 17°:26 16°:37 1047
60 60 60
727 1046 997

as m ex of Lat ---- 1026 --- 0.011147
So is Radius ------ 90°:00 --- 10
So is the ex of Long --- 1046 --- 0.019532
To the I Course 45°:33 10.004385
44°:27

as S E Course --- 44°:27 --- 9.845276
So is the ex of Lat 727 ------ 2.861534
So is Radius 90°:00 ------ 10
To the Dist --- 1041 ------ 3.017256

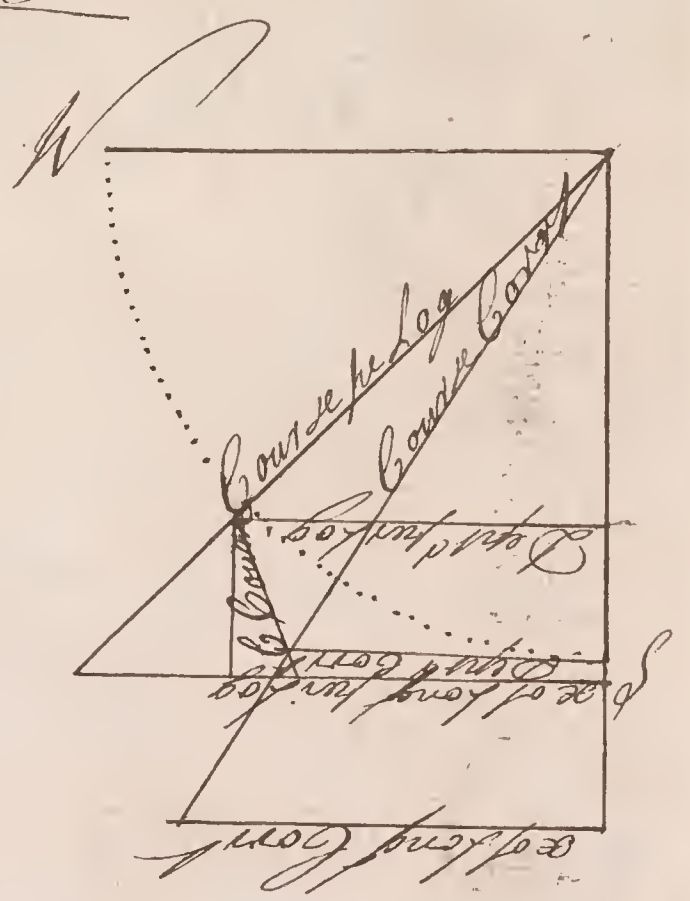
as Radius --- 90°:00 --- 10
So is the Dist --- 1041 ------ 3.017256
So is I Course 45°:33 --- 9.859614
To the Dep^r 742.8 --- 2.876870

as S E Curr^t Course 67°:30 --- 9.965615
So is Curr^t ex of Lat --- 270 --- 2.431364
So is S Curr^t Course --- 22°:30 --- 9.582610
To the Curr^t Dep^r 742.8 12.014204
2.046569

as prop^d ex of Lat --- 997 --- 2.998695
So is m ex of Lat --- 1047 --- 3.129366
So is the Dep^r --- 742.8 --- 2.870629
To the ex of Long --- 6526 5.929397
2.950702

as m ex of Lat 1047 --- 3.129066
So is Radius 90°:00 --- 10
So is the ex of Long 6526 2.950702
To the I Course 22°:16 2.600534
67°:44

as S E Course 67°:44 --- 9.927151
So is the ex of Lat 997 --- 2.998695
So is Radius 90°:00 --- 10
To the Dist --- 1165 --- 3.071544



22°:30
90°:00
67°:30 S E Course

Lat^d of
Lat^e Log 997
Current 270 ex of Lat

60)6531.4
60
253
240
13

Long^t from 05°:14 W
ex of Long^t 14°:13 W
Long^t in 19°:27 W

742.8
1.16
Dep^t 601.0 Corrected

By the Log	Courses	Dist^r	ex of Latitude N	ex of Latitude S	Departure E	Departure W	Latt^e in North	ex of Long	Long^t in	
	NW	1041	727			742.8	37°:50	1046	22°:30 W	
Corrected	NW BN	1165	997			654.6	33°:20	653	19°:27 W	

A Ship from Ushant Sails by the Log in a Current setting N N E till she arrive in Latt.e 46: 10 North & Long.e 20° : 20 West when she is by observation in Latt.e 50° : 50 North I demand her correct Course Departure Distance and Long.e

Ushant Lat.e 48° 30 N 3337
Lat.e Log 46° 10 N 3180
dff of Latt.e Log 2° 22 M x 207 of Latt.e
60
140

As M dff of Latt.e -- 207 -- 2.315970
To to Radius 90° 00' -- 10
To is the dff of Long.e 916 -- 2.962443
To the Course 77° 17 -- 10.646673
12° 43

As S C Course -- 12° 43 -- 9.342679
To to the dff of Latt.e -- 140 -- 2.461126
To is Radius -- 90° 00' -- 10
To the Dist.e -- 636 -- 2.803449

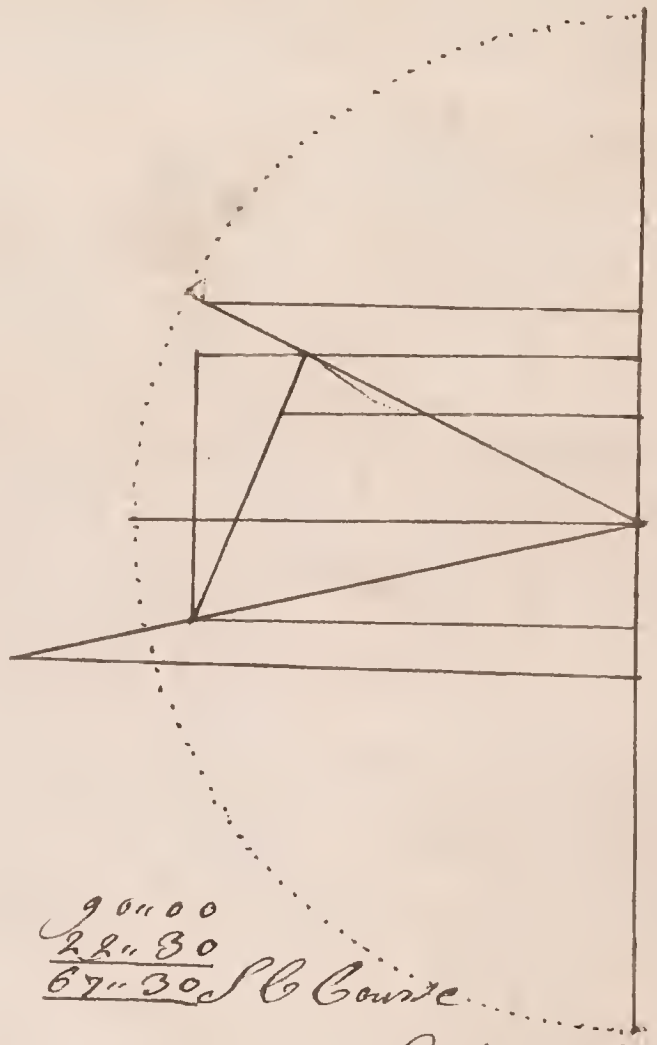
As Radius -- 90° 00' -- 10
To to the Dist.e -- 636 -- 2.803449
To is S Course 77° 17 -- 9.989214
To the Dep.t 620.4 -- 2.792663

As S C C Course -- 67° 30 -- 9.965615
To to Curr.t dff of Latt.e -- 260 -- 2.414158
To is S C Course -- 22° 30 -- 9.582640
To C Dep.t -- 116 -- 2.029998
620.4 -- 2.064836
5044

As prop.t dff of Latt.e -- 140 -- 2.146126
To to M dff of Latt.e -- 216 -- 2.301454
To is the Dep.t -- 5044 -- 2.702775
5093229
To the dff of Long.t -- 7762 -- 2.891101

As M dff of Latt.e -- 216 -- 2.334454
To to Radius -- 90° 00' -- 10
To is the dff of Long -- 7762 -- 2.891101
To the S Course -- 74° 29 -- 10.556642
15° 51

As S C Course -- 75° 51 -- 9.427854
To to the dff of Latt.e -- 146 -- 2.146126
To is Radius -- 90° 00' -- 10
To the Dist -- 523 -- 2.718980



66 / 77 & / 12
60
17 &
12 6
5 &

Ushant Long.t 05° 02 W
dff of Long 12° 58 W
Long.t in 16° 00 W

46° 10
50° 50
4° 40
60
240

By	Course	Dist	dff of Latitude N	dff of Latitude S	Departure E	Departure W	Latt.e in North	dff of Long W	Long in W
the Log	W B S	636	140			620.4	46° 10	15° 18	20° 20
Corrected	N N W ½ W	523	140			504.4	50° 50	12° 58	16° 00

A Ship from the Lizard sails S W b W 780 Miles in a Current that sets in the same time Due East 248 Miles I demand her correct Course Depar. Diff Distance and Long.de in

As Radius ---- 90.00 --- 10
So to the Dist --- 780 ---- 2.892095
So is S b Course 33.45 9.744739
To the ∝ of Lat.de 400.4 2.636834

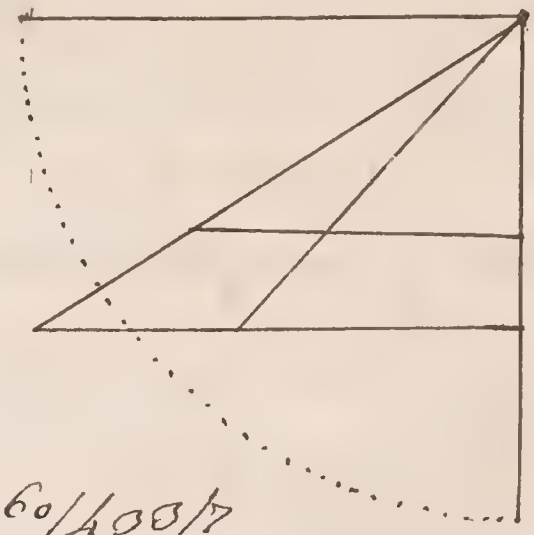
As Radius ---- 90.00 ---- 10
So to the Dist -- 780 ---- 2.892095
So is S Course -- 56.15 --- 9.919846
To the Depart -- 646.5 -- 2.811941

As prop.l ∝ of Lat.de --- 433.4 ---- 2.636834
So to m ∝ of Lat.de --- 628 ---- 2.797960
So is the Depart --- 646.5 --- 2.811941
To the ∝ of Long.de --- 939.9 --- 2.977901

As the ∝ of Lat.de ---- 433.4 ---- 2.636834
So is Radius --- 90.00 ---- 10
So is the Depart Cor.d 400.5 2.602602
To the S Course 42.15 9.965768
47.15

As S b Course ---- 47.15 ---- 9.865887
So to the ∝ of Lat.de --- 403.4 --- 2.605834
So is Radius --- 90.00 ---- 10
To the Dist ---- 590.1 --- 2.770947

As prop.l ∝ of Lat.de --- 433.4 ---- 2.636834
So to m ∝ of Lat.de --- 628 ---- 2.797960
So is the Depart --- 400.5 --- 2.602602
To the ∝ of Long.de --- 580.4 --- 2.763728



60/400/7
420
13

Lizard Lat.de 49.57 N
∝ of Diff Lat.de 07.13 S
Lat.de in 42.44 N

6470
2842
M ∝ of Lat 628 Corrected 646.5
248
400.5

60/580/9
540
40

Lizard Long.de 05.14 W
∝ of Long.de 09.40 W
Long.de in 14.54 W

By	Course	Dist	∝ of Lat.de N	∝ of Lat.de S	Departure E	Departure W	Lat.de in North	∝ of Long.de West	Long.de West
the Log	S W b W	780		403		248	42.44	909.9	20.55
Corrected	S W b S 1/2 W	590.1		403		400.5	42.44	580.4	14.54

To find the Variation by an Amplitu

Variation of the Compass is the Number of Degrees and Minutes the Needle points from the True Poles of the World to the Eastward or Westward.

1 To find the Suns Amplitude

The Suns Amplitude is his Distance at rising or Setting from the East or West Points of the Compass.

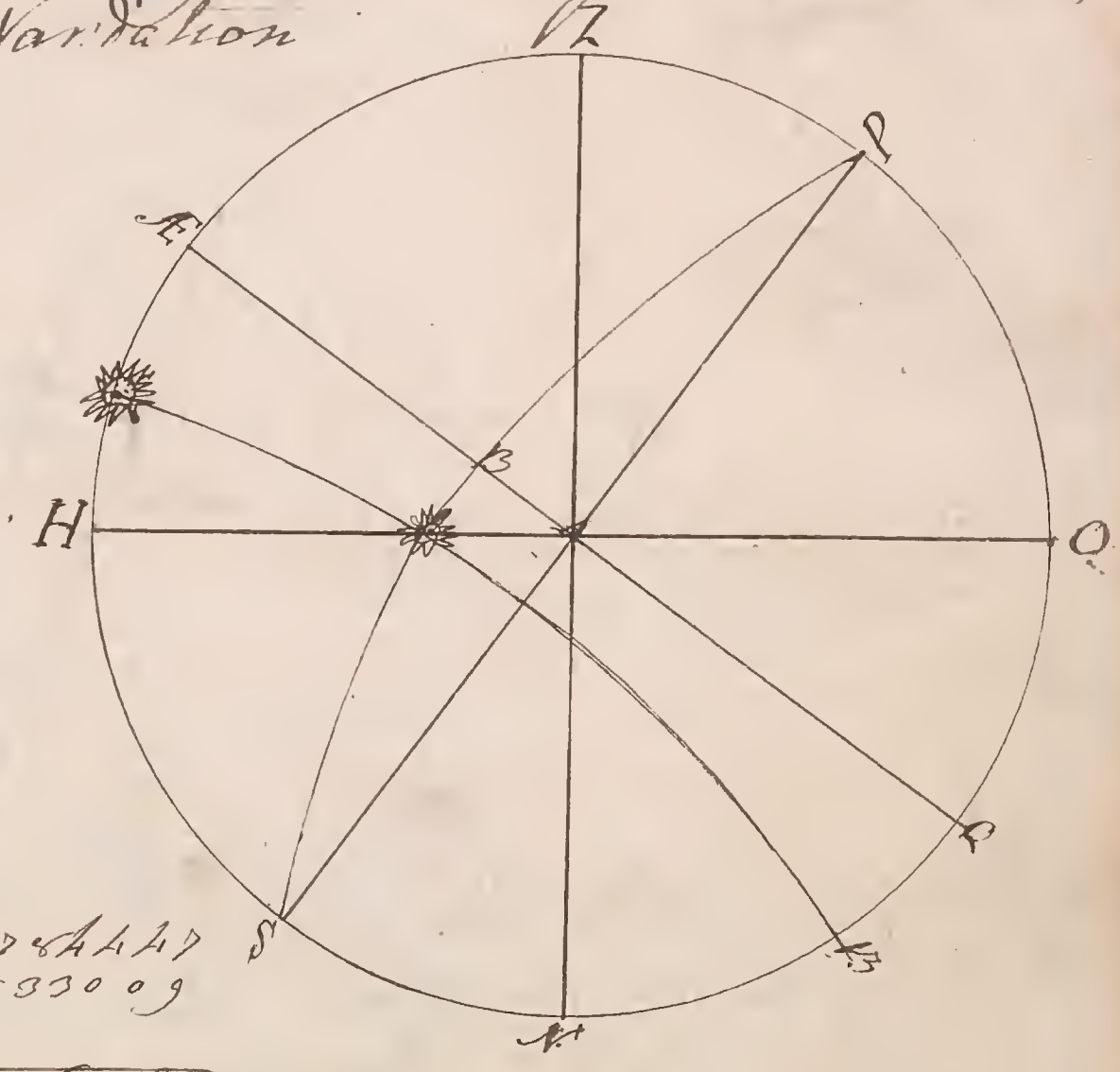
2 To find the Variation by an Amplitude

The Variation is the Difference between the true and magnetic Amplitude. at Sun Rising if the magnetic Amplitude be to the Northward of the true Amplitude the Variation is East but if it be to the Southward it is west at Sun Setting if the magnetic Amplitude be to the Northward of the true amplitude the Variation is West but if to the Southward it is East

In Lat^{de} 52 : 30 North on Novr 21, 1759 the Sun's Mag. Ampl. at Rising being 46 South^{ly} I demand the Variation

52 : 30
90 : 00
37 : 30 L A

19 : 57 C
90 : 00
70 : 03



as S C Lat^{de} .... L A 37 : 30 ---- 9.78 4447
To to Suns Dpclt L B 19 : 57 - 9 5330 09
To is Radius L B 90 : 00 - 10.
To the True amplitude 9.7846 62

True amplitude 53 : 06 S
magnet ampht 43 : 00 S
Variation 10 : 54 E

In Latt. 51°:31 North on May 30th 1760 the Sun's Mag. Amp. at Setting being 47°:30 North I demand the Variation

Z

P

E

B

H

O

S

Q

N

51°:53	51°:31
90°:00	90°:00
66°:07	38°:29 LA

36°:46
90°:00
C True 53°:12 amplitude

47°:30
90°:00
C magg 42°:57 Amplitude

True amplitude 36°:46 N
magg amplitude 47°:30 N
Variation 10°:42 W

As S C Lat° ... LA 38°:29 ... 9.799991
So is Suns Decli LB 21°:59 ... 9.571860
So is Radius LB 90°:00 ... 10
To the True amplit 36°:46 ... 9.777369

In Latt. 23°:29 North on June 22d. 1760 the Sun's Mag. Amp. at Rising being 40° North I demand the Variation

Z

E

P

H

O

S

Q

N

B

90°:00
23°:29
66°:31

90°:00
23°:29 N
66°:31

True amplitude 25°:45 N
magg amplit 40°:00 N
Variation 14°:15 E

As S C Lat° LA 66°:31 ... 9.962453
So is Suns Decli LB 23°:29 ... 9.600409
So is Radius LB 90°:00 ... 10
To the True amplitude 25°:46 ... 9.637956

In Latd. 27°:50 North on March 1, 1760 the Sun's Mag. amp. at Setting being 6°:45 North I demand the Variation

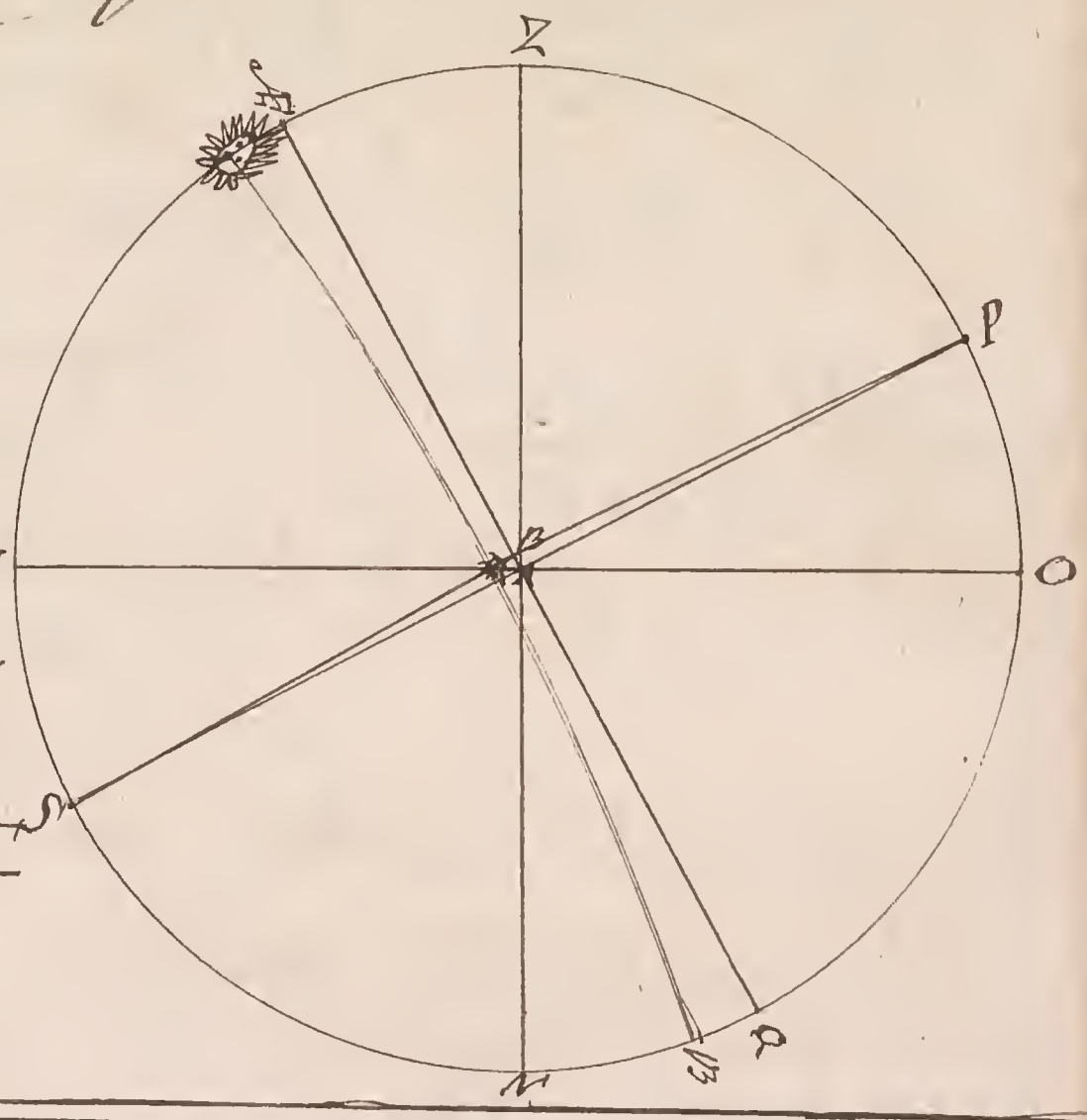
90°00
27°50
62°10

90°00
27°15
62°45

90°00
6°45
magt 83°15 ampls.

True amplitude 0 8°:16 W
Magt amplitude 0 6°:45 N
Variation 15°:01 W

as S C Lat L A 62°:10 --- 9.946604
To to Suns Decl L 13 07°:18 - 9.104025
To to Radius L 13 90°:00 - 10 / 9.157421
To the True ampld 8°:16



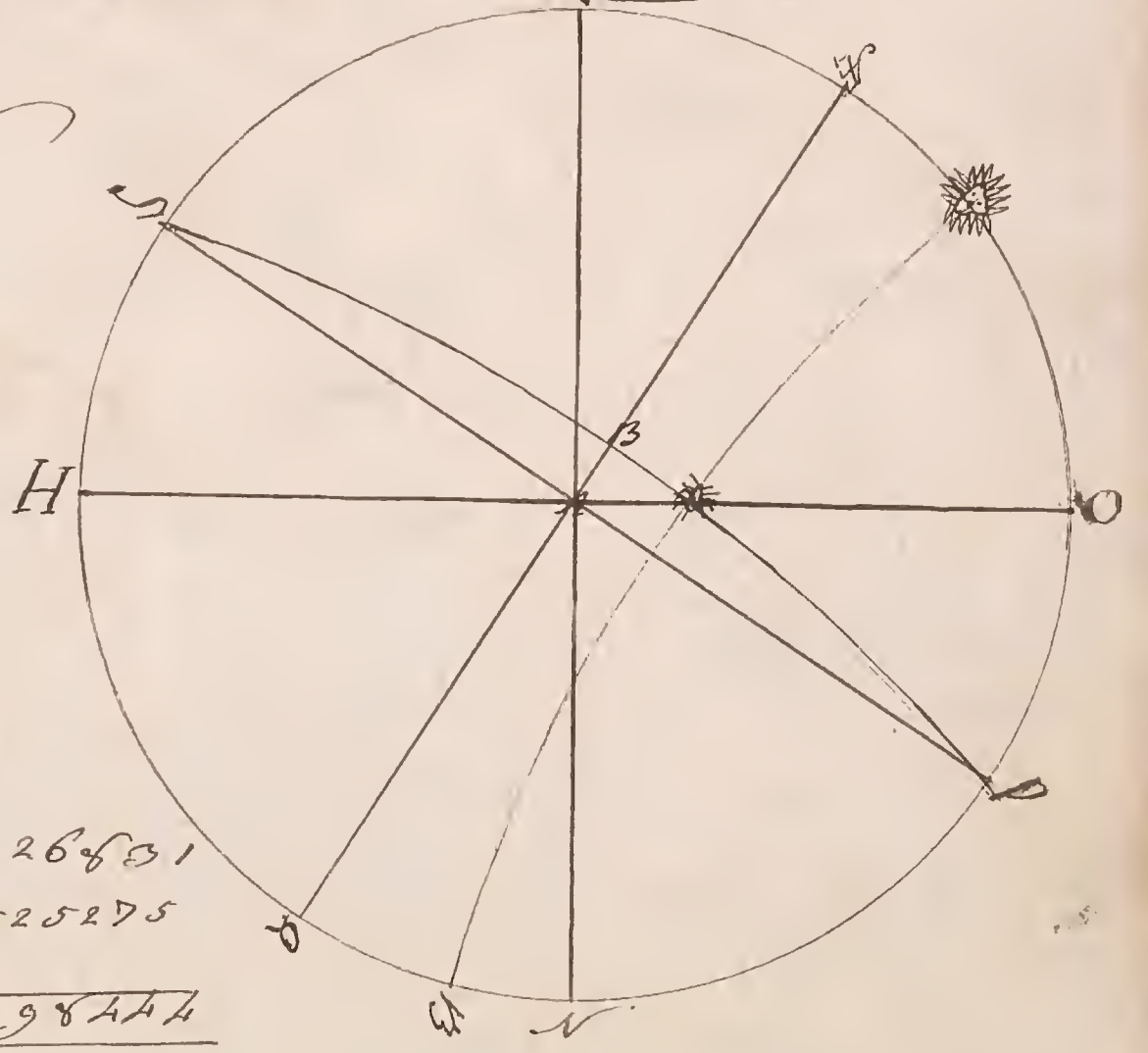
In Latd. 32°:20 South on July 25th. 1760 the Suns Mag. amp. at Rising being 15° North I demand the Variation

90°00
32°:20
57°:40

90°00
19°35 N
70°25

True amplitude 21°:17 N
Magt Amplitude 15°:00 N
Variation 6°:17 W

as S C Lat L A 57°:40 - 9.926631
To to Suns Decl L 13 19°:35 - 9.525275
To to Radius L 13 90°:00 - 10 / 9.598444
To the True ampld 21°:17

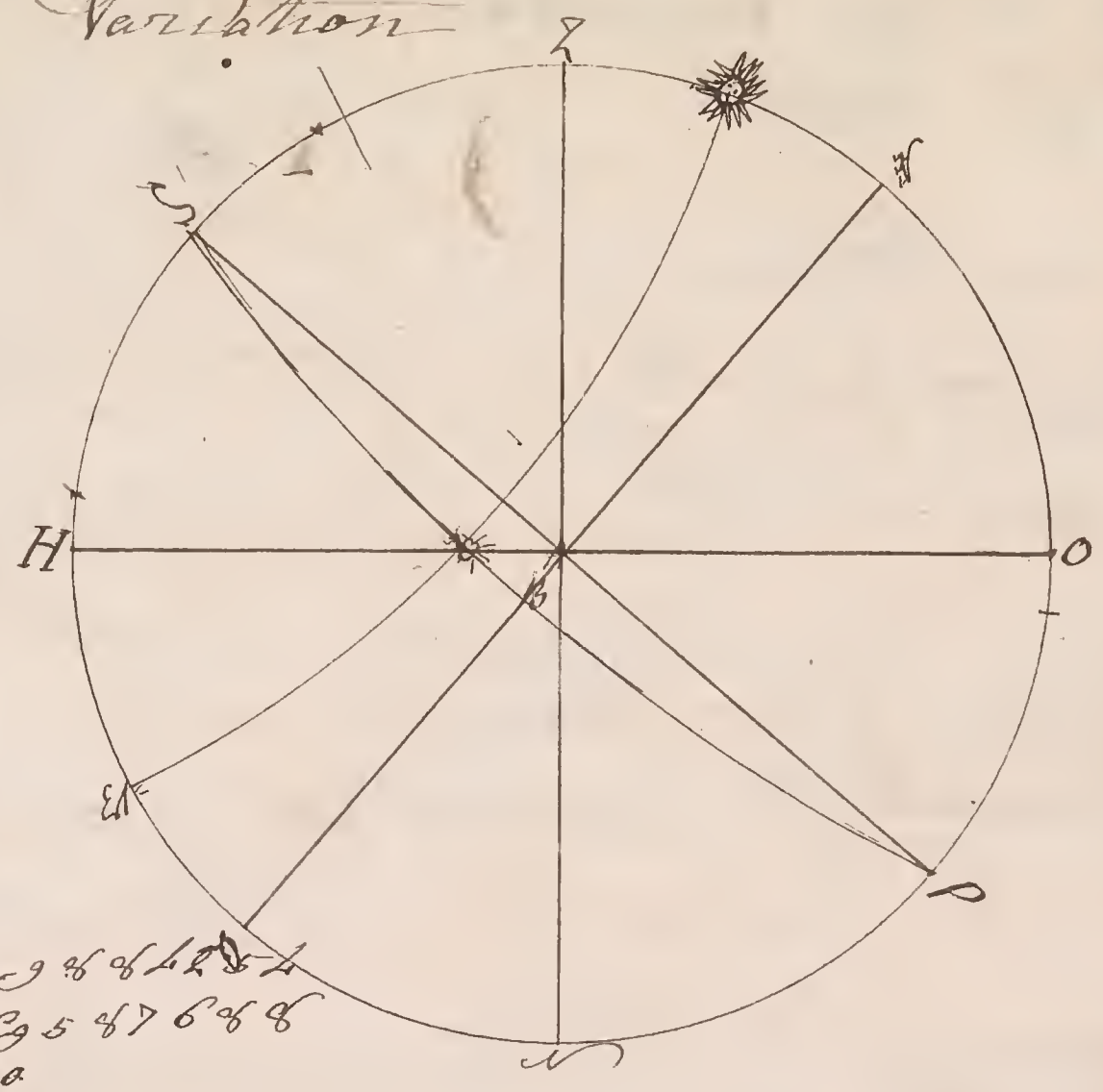


In Latt. 40 South on January 4th. 1760 the Suns Mag. Amp. at Setting being 37.00 South I demand the Variation

90.00	90.00
40.00	22.46
50.00	67.14

90.00	90.00
37.00	30.21
52.50	59.39

True amplitude 30.21 S
Magg Amplitd. 37.10 S
Variation 6.49 E



As S C Latt L A 50.00 ---- 9.8842854
To L Suns Dedn L B 22.46 9.5876868
So is Radius L B 90.00 10
To the True amplitd 30.21 9.7034834

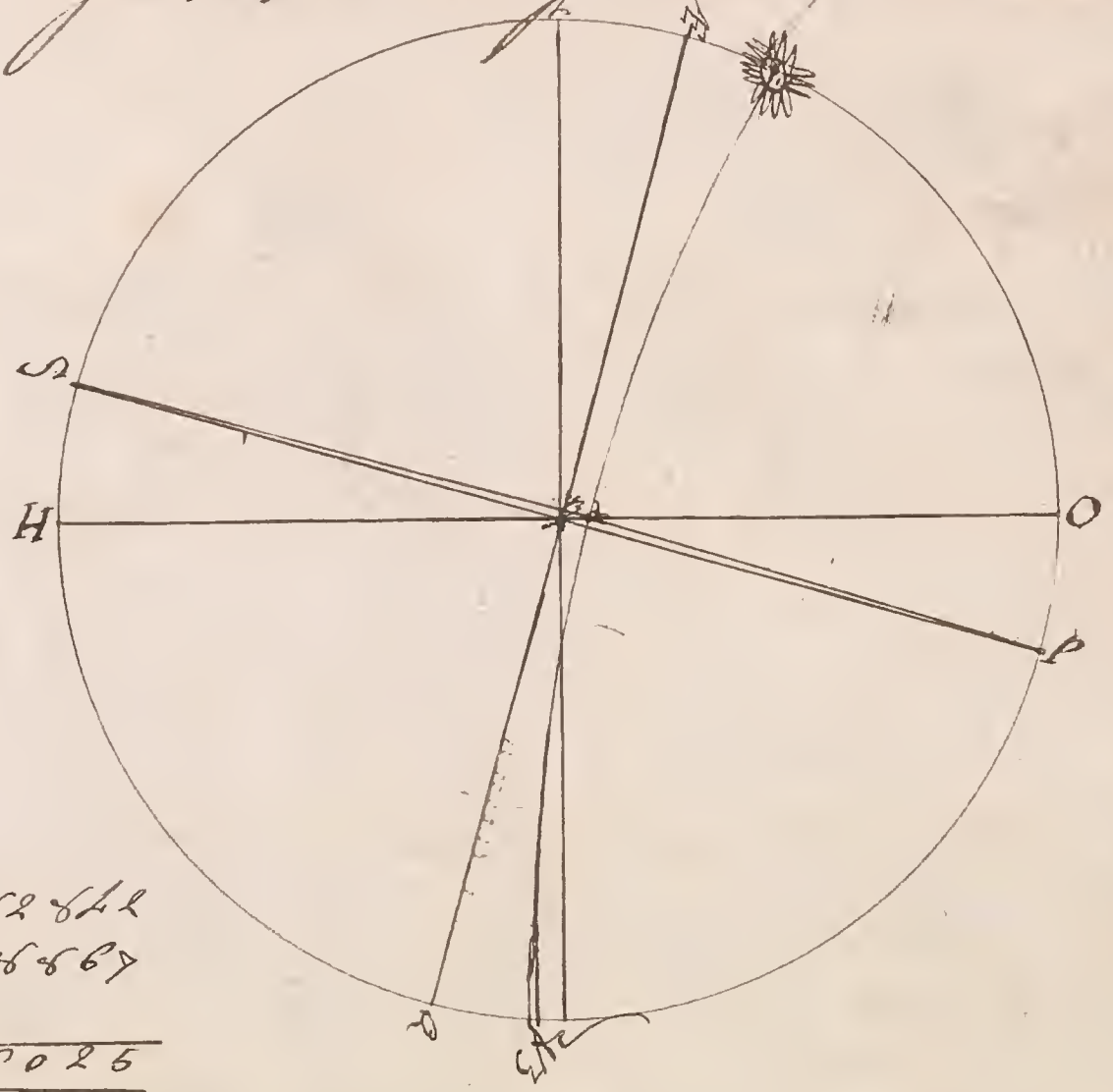
In Latt. 16 South on April 20th. 1760 the Suns Mag. Amp. at Rising being A.15 South I demn. ye Variation

90.00	90.00
16.00	11.45
74.00	78.15

90.00
12.14
As 77.16 Amplitd

90.00
02.15
92.15
47.07

True Amplitd 12.14 N
Magg Amplitd 02.15 S
Variation 16.29 W



As S C Latt L A 74.00 --- 9.9628424
To L Suns Dedn L B 11.45 9.3048867
So is Radius L B 90.00 10
To the True amplitd 12.14 9.3260025

To find the Variation by an Azimuth

To find the Suns Azimuth

1 The Suns Azimuth is that point of the Compass he is on at any given time of the Day

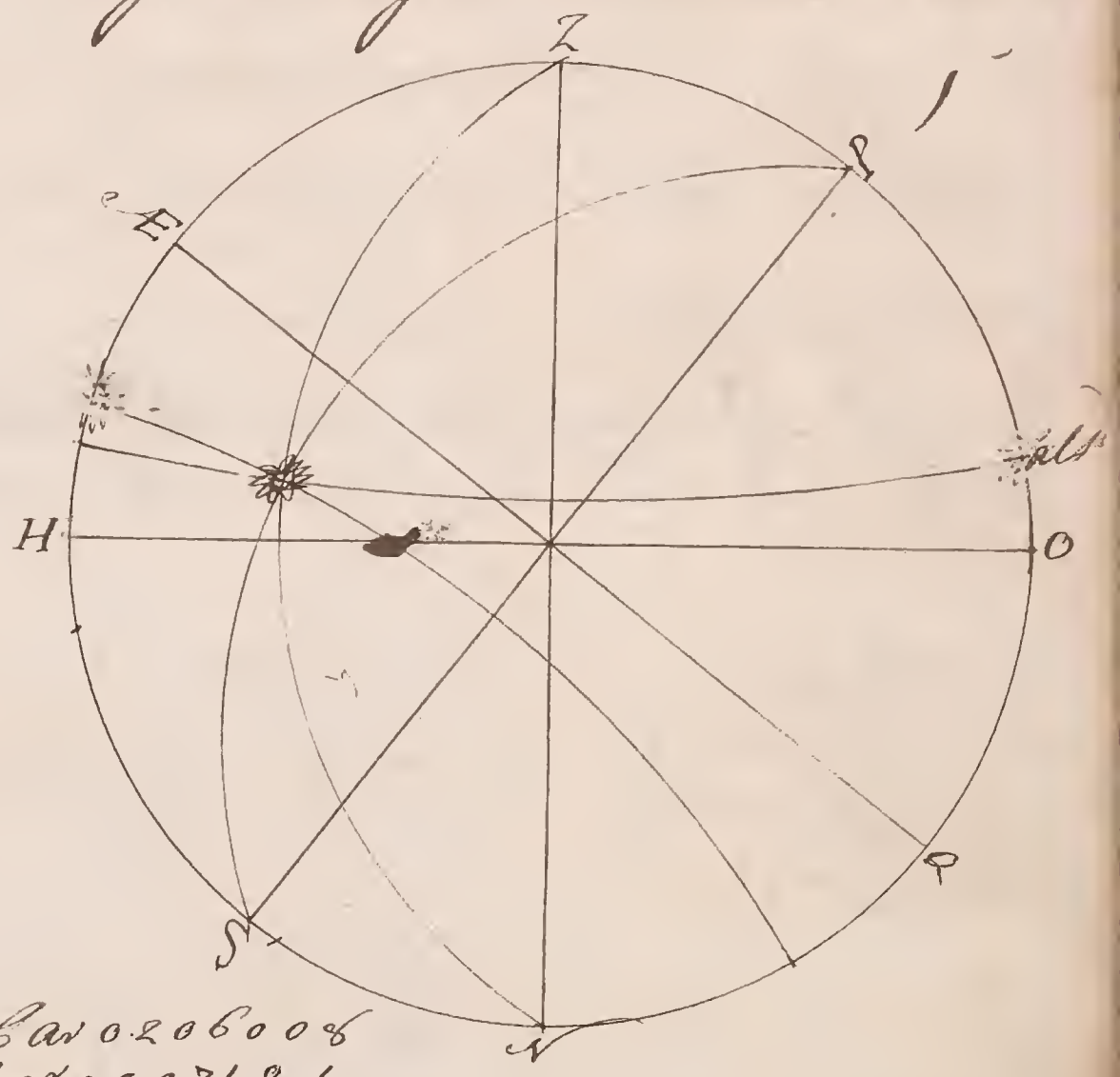
2 To find the Variation by an Azimuth

The Difference between the true and magnetic Azimuth is the Variation.

In the Forenoon if the Magnetic azimuth be to the Northward of the true Azimuth the Variation is East but if to the Southward it is West.

In the afternoon if the magnetic Azimuth be to the Northward of the true Azimuth the Variation is West but if to the Southward is is East.

In Lat.e 51:31 North on Nov.r 27.th 1759 the Suns alt.e being 10:20 when his Magnetic Azimuth is SE 9 decr. the Variation



1

Lat.e in 90:00
51:31
C Lat.e 38:29

Declin 90:00
21:10 S
C Declin 68:50

alt.e 90:00
10:20
C alt.e 79:40

90:00
Decl.n 21:10
C Decl.n 111:10

17:29
90:00
72:31
72:31
145:00
90:00
True Azimuth 55:02 S
magn.e Azimuth 45:00 S
Variation 0:02 W

2

C Lat.e 38:29 - 9.7893991 Car 0.2060006
C alt.e 79:40 - 9.9928698 Car 0.0007101

C Declin 111:10

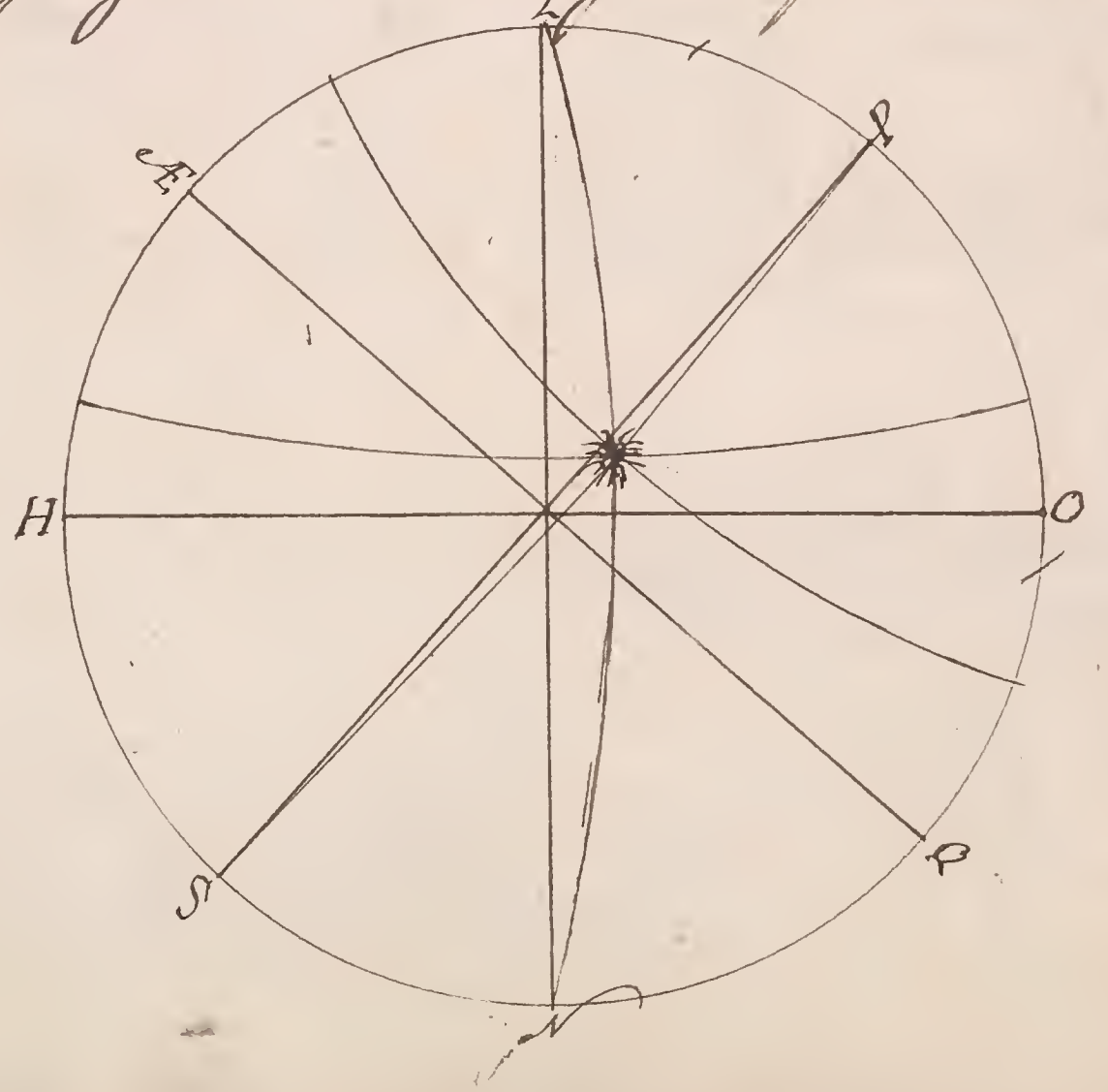
9)229:19
114:39
180:00
65:21 ..... Sines - 9.9584503
03:29 ..... Sines - 8.7863605
17:29 9.4777608

How to project the Figure

The Primitive Circle being drawn and quartered H O represents the Horizon and Z N the prime Vertical or East and West Line: H is due South O is due North Z is the Zenith, and N the Nadir. Set off the Lat^d above the Horizon from O to P when it is North or from H to S when it is South and draw P S for the axis of the World: also E Q at right Angles thereto for the Equinoctial, then from E Q Set off the Declination according to its Name and with the Tangent Compliment thereof Sweep the path of the Suns Way for that Day. also from H O Set off the Suns alt^d above the Horizon and with the Tang Compliment thereof Sweep a Parallel of altitude to Cut the ☉ way in ☉ thro which and the Poles sweep a great Circl P ☉ S as also another great Circle Z ☉ N thro the Zenith and Nadir and your Figure will be Compleat. The angle at Z is always the Azimuth; and is measured on the Horizon from the Line of half Tangents from the Center of your Figure: by taking it from 90 if less than a Quadrant or by taking 90 out of it when more than a Quadrant.

In Lat^d 48 North on May 30th 1760 the Sun's Alt^d being 13:20 when his Mag. Azimuth is W b N 7 degr^s of Variation

Lat^d 90 ° 00
C Lat 48 ° 00
42 ° 00
Declin 90 ° 00
21 ° 53 N
C Decl 68 ° 07
alt^d 90 ° 00
13 ° 20
C alt^d 76 ° 40



C Latt 42.00 - 9.825511 Car 0.174488
C Alt 76.40 - 9.988130 Car 0.011866
C Declt 64.07

186.47
93.23
180.00
66.37 ---- Sines 9.999242
25.16 -- Sines -- 9.630257
54.05 19.816553
9.906426

54.05
90.00
35.55
35.55
True azimuth 71.50.N
mag: azimuth 78.45 N
Variation 6.55 E

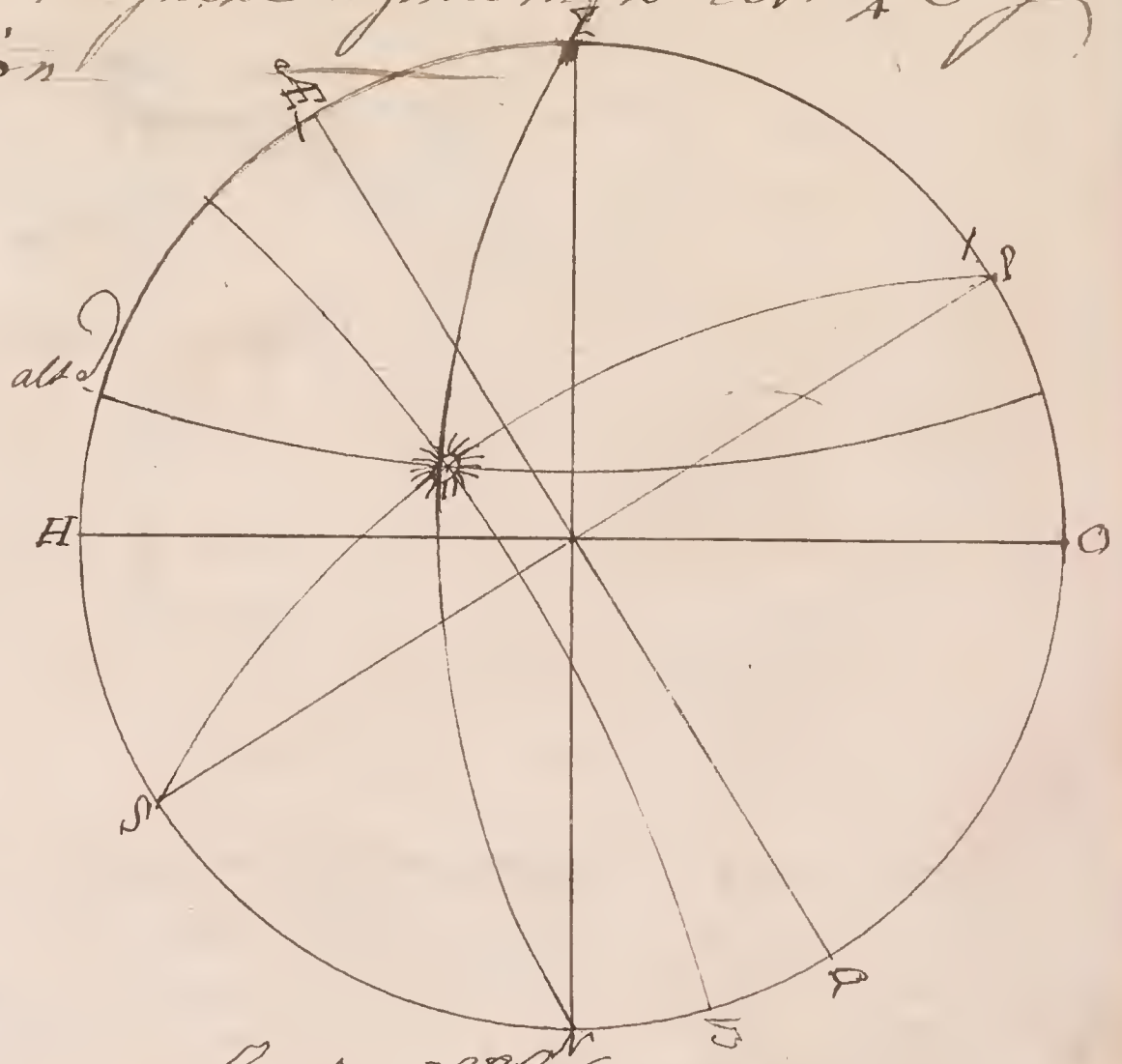
In Latt. 32:15 North on Febr. 5th 1760 the Sun's Alt. being 17:20 when his Magnetic azimuth is Eb.N 3/4 E I demand the Variation

90.00
Latt 32.15
C Latt 57.45

90.00
Declt 16.00
C Declt 74.00

90.00
alt 17.20
alt C 72.40

90.00
16.00
C Declt 106.00

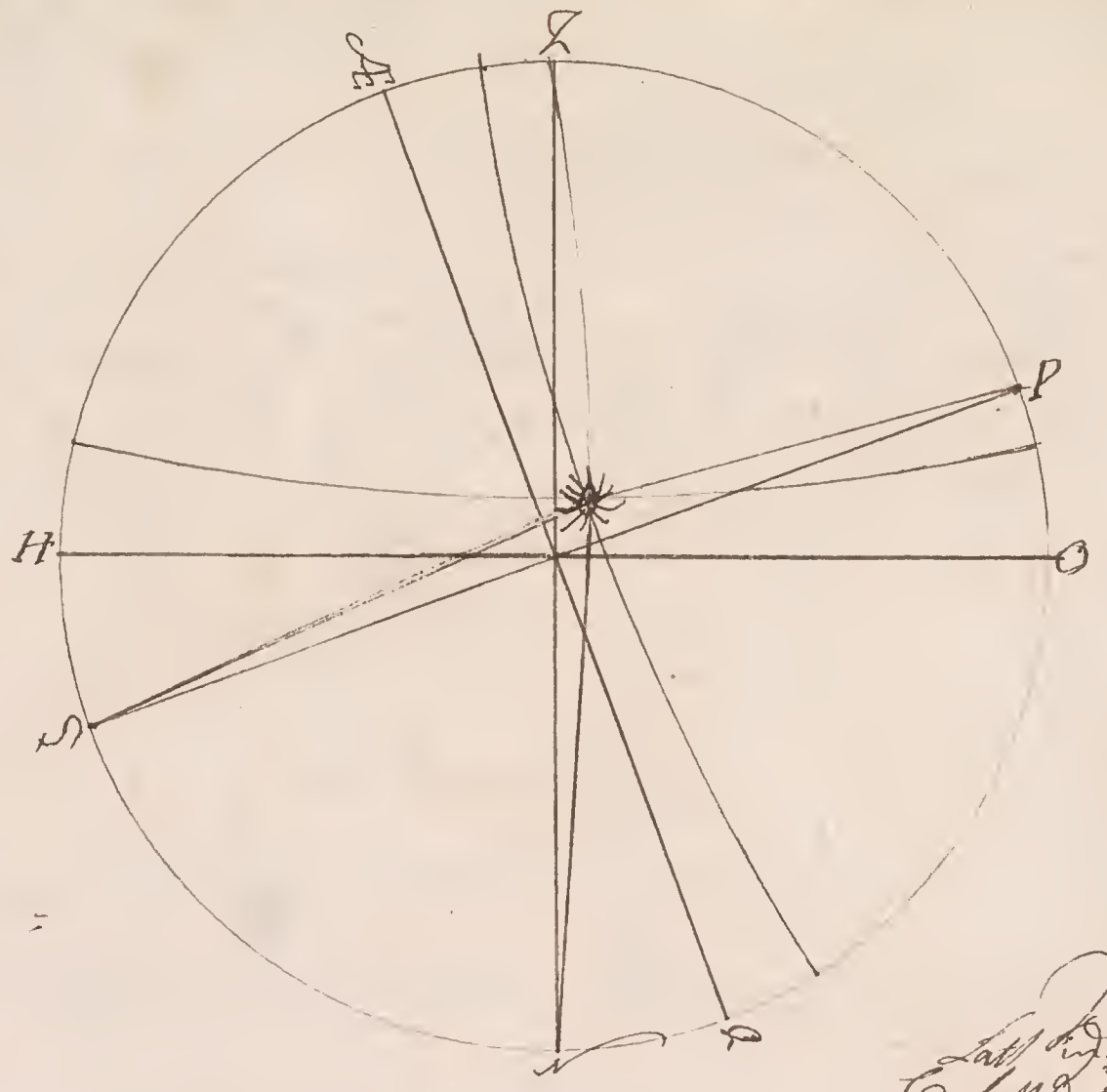


C Latt 57.45 --- 9.927231 Car 0.072806
C alt 72.40 --- 9.979816 Car 0.020185
C Declt 106.00 ---

236.25
118.12
180.00
61.48 --- Sines --- 9.944126
12.12 --- Sines --- 9.332409.51
19.363026
9.681514

28.43
90.00
61.17
61.17
True azimuth 122.34 N
mag: azimuth 87.11 N
Variation 35.23 E

In Lat^{e} 20° North on April 28th 1760 the Sun's Alt^{e} being 12°:50 when his Mag. azimuth is E b S I demand the Variation



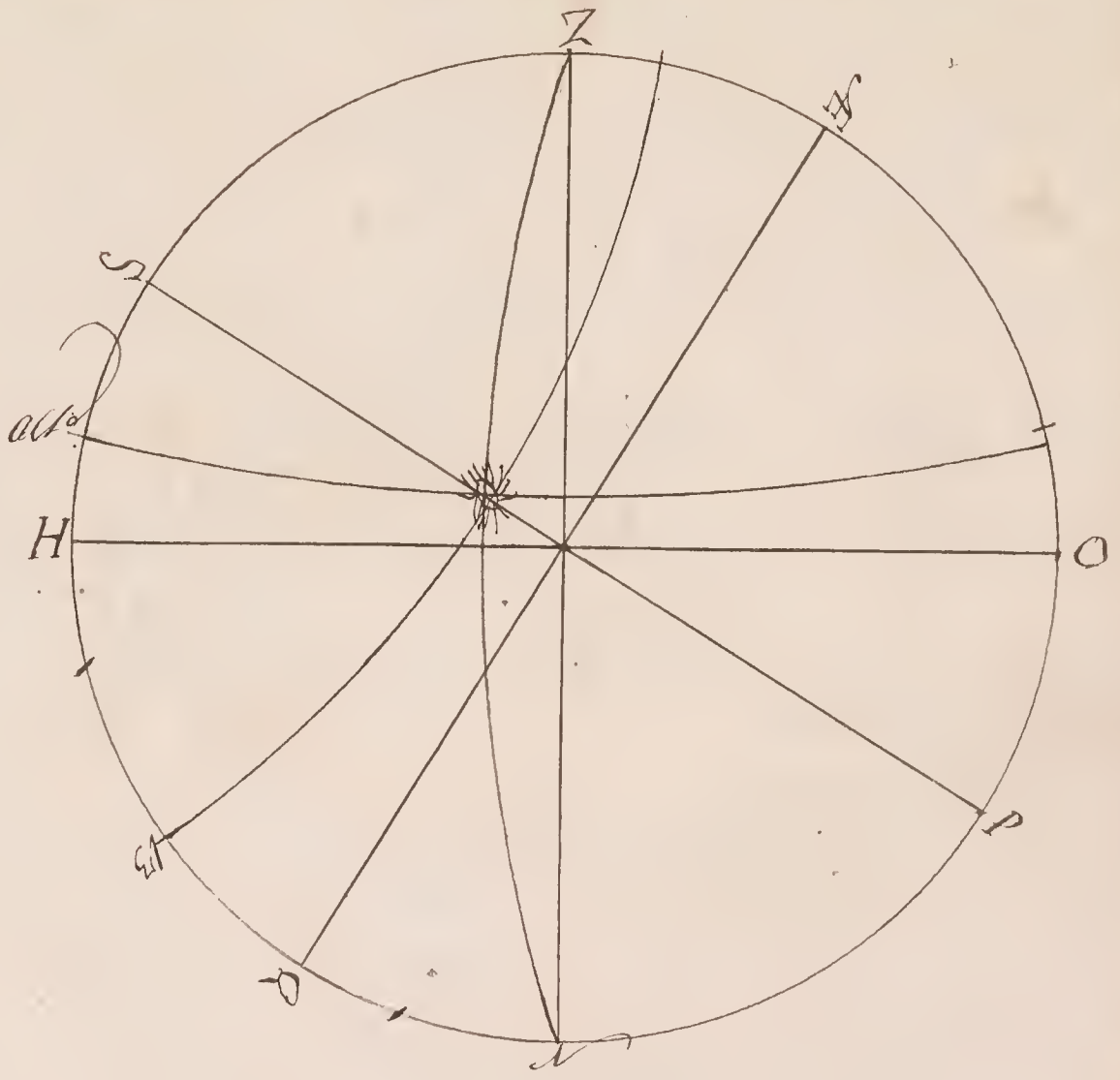
Lat^{e} 90°00'
20°00'
Lang 70°00'
90°00
alt ☉ 12:50
Calt 77°10'
90°00
Decl ☉ 11°45'
Decl 78°15'

☾ Lat^{e} 70°00 9.9729 60 Ca^{t} 0.0270 10
☾ alt 77°10 9.9891 46 a^{o} 0.0109 65

☾ Decl 78°15
2)225°25
112°42
180°00
67°18 -- Sines -- 9.9649 84
34°27 -- Sines -- 9.7525 76
2)19.7555 55
9.8777 77

49°00
90°00
41°00
41°00
82°00
180°00
True azimuth 98°00 S
Magg azimuth 81°34
16°26 W

In Latt. 31:20 South on Decr. 1. 1760 the Sun's
Altt being 12:20 when his Mag. azimuth is S 86 E
I demand the Variation



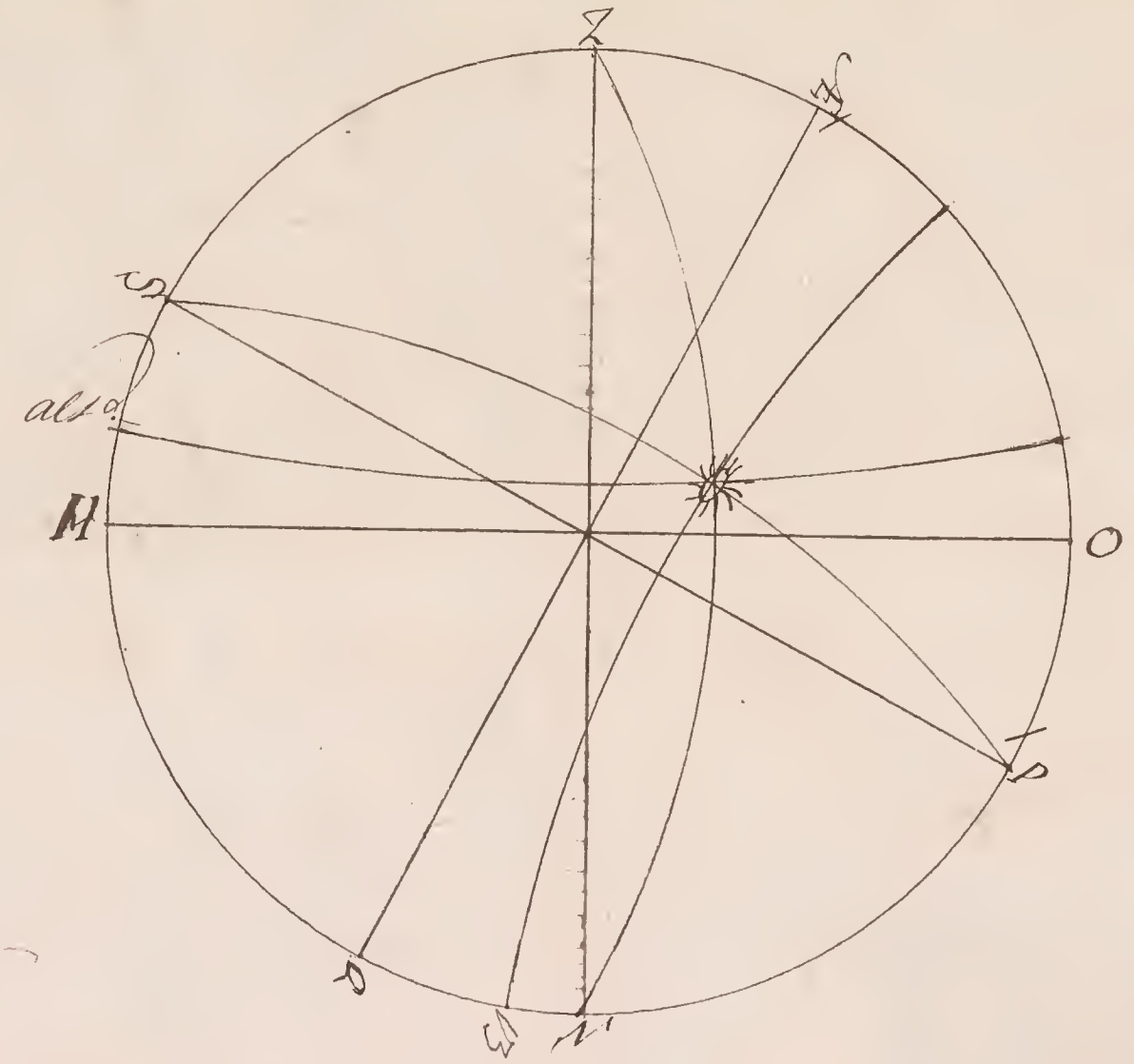
Latt ⊙ in 90°00
31°20
∁ Latt ⊙ 58°40
90°00
Altt ⊙ 12°20
∁ Altt 77°40
Decl ☓ 90°06
Decl ☉ 21°58 S
∁ Decl 68°02

∁ Latt ⊙ 58°40 - 9.931537 Cas 0.068462
∁ Altt ⊙ 77°40 - 9.989860 Ca 0.010139

∁ Decl 68°02
2)204°22
102°11
180°00
77°49 ---------- Sines 9.990107
34°09 ---------- Sines 9.749242
2)19.817950
9.908975

54°11
90°00
35°49
True azimuth 35°49
71°38 S
magg azimuth 56.15 S
Variation 15°23 W

In Latt. 28:50 South on May 15th 1760 the Suns Altitude being 11:20 when his Magnetic Azimuth is W b N 1/4 W I demand the Variation



Latt 90:00
in 28:50
C Latt 61:10
alt 90:00
alt 11:20
C alt 78:40
90:00
Decli 19:02 N
C Decli 70:58
Decli 109:02

C Latt 61:10 - 9.942517 Cos 0.057482
C alt 78:40 - 9.994486 Cos 0.005514
C Decli 109:02
124:54
124:26
180:00
55:34 ---- Sines 9.916341
15:24 ---- Sines 9.424156
19.340497
9.703215

30:20
90:00
59:40
59:40
119:20
180:00
True azimuth 60:40 N
magg azimuth 84:22 N
Variation 23:42 E

To make a plain Chart. 1759

Take a large Sheet of Paper, and down its Edges on each side Sett the Latitude from a line of equal parts; Also from the same line of equal parts, set off the Long.ds in Columns at the Top and Bottom of your Chart. Draw cross Lines at pleasure thro your Chart, at every Degree, every 5 Degrees, or every 10 Degrees of Latitude and Longitude; by these Lines set off a convenient Number of Bays Headlands, Capes, Harbours, Towns, &c. that are on or near the Sea Shore. Then make a Compass in some void place of your Draught and it is done.

To find the Course and Distance between any two Places by a plain Chart.

Draw a line between the two Places and a line parallel to that thro the Centre of your Compass which will represent the Course. Take the Distance between the two places in your Compasses and measure it ~~upon~~ either upon the Lat.de or Long.de Column: and you will have your Distance required in Degrees and Minutes.

But Note as neither Course or Distance is true on these sort of Charts, they are now intirely out of use among Sailors; in room of which they generally use middle Latitude Charts; which on account of the easiness wherewith every thing may be set off and measured on them are now almost every where called plain Charts.

60

Fair Isle

59

Ness of Noss

58

Buchan Ness

Aberdeen

57

Dundee

Fife Ness

Edinburgh

Berwick

Newcastle

Shields

55

Sunderland

Hartlepool

Whitby

Scarborough

Flamborough

Burlingston

54

Hull

Grimesby

Boston

53

Lynn

Yarmouth

Lowestoft

Orfordness

Aldborough

Harwich

52

Colchester

London

Ryprapps

Middlebrough Sluice

Rochester

Margate

Foreland

Longness

Deal

Dungeness

Calais

Boulogne

Portsmouth

Pool

Isle of Wight

Beachy

51

Dover

Winchelsea

Rye

Hastings

Dieppe

50

Cowhels

Alderney

Guernsey

Jersey

Cape de la Hogue

Cape Barfleur

Cape la Hague

49

48

Fecamp

Caen

6 7 8 9 10 11 12 13

60 59 58 57 56 55 54 53 52 51 50 49 48

Norway

Jeeder

Norway

Aarhuus

Aalborg

Mastersland

Gottenburgh

Skaw

Leson Ilse

Anholt Ilse

Kattegat

Skaw

Elsenburgh

Helsingborg

Helighland Ilse

Ameland Ilse

Schelling Ilse

Texel Ilse

Vlie Ilse

Bremen

Hamburgh

Emden

Wismar

Stralsund

Fair Isle
Buchan Ness
Aberdeen
Dundee
Berwick
Newcastle
Shields
Sunderland
Hartlepool
Whitby
Scarborough
Flamborough
Burlington
Hull
Grimesby
Boston
Lynn
Yarmouth
Lowestoft
Harwich
Colchester
London
Rochester
Margate
Dungeness
Portsmouth
Isle of Wight
Purbeck
Poole
Weymouth
Cowes
Rippraps
Middleburgh Isle
Rotterdam
Antwerp
Ostend
Dunkirk
Calais
Dieppe
Havre
Caen
Cherbourg
Alderney
Guernsey
Jersey
Cape Barfleur
Cape de la Hogue
St Malos
Cape Frehel
Tessel
Norway
Sognefiord
Bergen
Shetland
Faro
Iceland
Greenland
Jan Mayen
Seson Isle
Arran Isle
Elsenburgh
Helsingborg
Gottenburgh
Skagerrack
Jutland
Helighland Isle
Ameland
Schelling
Texel
Ily Isle
Bremen
Hamburgh
Emden
Weimar
Straalsund
Rostock
Lubeck
Hamburgh
Bremen
Emden
Amsterdam
Rotterdam
Middleburgh
Ostend
Dunkirk
Calais
Dieppe
Havre
Caen
Cherbourg
Alderney
Guernsey
Jersey
Cape Barfleur
Cape de la Hogue
St Malos
Cape Frehel
Isle of Wight
Portsmouth
Weymouth
Poole
Purbeck
Cowes
Rippraps
Middleburgh Isle
Rotterdam
Antwerp
Ostend
Dunkirk
Calais
Dieppe
Havre
Caen
Cherbourg
Alderney
Guernsey
Jersey
Cape Barfleur
Cape de la Hogue
St Malos
Cape Frehel

I demand the Bearing and Distance of Rotterdam from Berwick

Answer Rotterdam Bears from Berwick E & S E Distance 459 miles

I demand the Bearing and Distance of the Naze of Norway from Winterton Ness

Answer the Naze Bears from Winterton Ness N E B E Distance 270 miles

I demand the Bearing and Distance of Cromer from Buchan Ness

answer Cromer Bears from Buchan Ness S S E ½ E Distance 310 miles

To make a middle Latitude Chart: being such a one as is generally used among Sailors, and called by them a plain Chart

Take a large Sheet and a long its Edges on all Sides make double Columns for the Latitude and Longitude Let the Latitude down its Sides from any Scale of equal parts: Then adding the Latitude at The Top and Bottom of your Chart together the half thereof will be your middle Latitude, where you must find how many miles make a Degree of Longitude and thereby set off all your Degrees of Longitude Draw Black Lines thro every 5 or every 10 Degrees of Latitude and Longitude: by which set off a proper Number of Headlands, Capes, Harbours, &c by help of which draw the Sea Coast; and having made a Compass in some void part of your Draught it is done

To find the Course & Distance between any two places in a middle Lat. Chart

Draw a Line between the two Places and a nother Line parallel there to thro the Center of your Compass which will Shew the Bearing. Then Take the Distance between the two Places in your Compasses and measure it on the Latitude Column or on a Scale of equal parts made by the Latitude Column, and you will have the Distance required.

10 9 8 7 6 5 4 3

56 55 54 53 52 51 50 49

Edinburgh

Ilse Torre

Ilse of arran

Ilse arran

Cardigan Bay

Carnarvon

Bags Broad Haven

Lambay Ilse

Ilse of man

Lancaster

Galway

Dublin

Holy head

Gall

Barvey Ilse

Limerick

Waterford

Wexford

St Davids Head

Milford

Swansey

Bristol

Caldy Ilse

Cow and Calf

Old head of Kinsale

London Ilse

Mort Bay

Hartland Point

Exmouth

Torbay

Falmouth

Lizard

Seven Stones

Scilly Islands middle

Eddystone

Land's End

Guernsey

Ilsede Bas

Ushant

Conquet

Scarns

Plymouth Sound

Berwick
Newcastle
Shields
Sunderland
Hartlepool
Whitby
Scarborough
Flamboro Head
Burlington
Hull
Grimesby
Spurn
Blakeney
Boston
Lynn
Wells
Cromer
Winterton
Yarmouth
Aldborough
Gt Yarmouth
Lowestoft
Harwich
Colchester
Ripraps
N Foreland
London
Rochester
Margate
Sandwich
Downs
Foreland
Dover
Beachy Head
Portsmouth
Isle of Wight
Cowes
Yarmouth
Poole
Exeter
Plymouth
Falmouth
Scilly
Land's End
Lizard
Start Point
Portland
Alderney
Casket
Jersey
Cape Barfleur
Cape La Hogue
Havre de Grace
Fecamp
Dieppe
Calais
Gravelines
Dunkirk
Ostend
Sluys
Flushing
Helvoetsluys
Rotterdam
Amsterdam
Antwerp

56
55
54
53
52
51
50
49

4 3 2 1 0 1 2 3 4 5

Edinburgh
Ilse Torre
Ilse of Arran
Ilse Arran
Stags
Broad Haven
Galway
Dublin
Lamboy Ilse
Ilse of man
Barsey Ilse
Holy Head
Liverpool
Limerick
Waterford
Wexford
Cork
Kinsale
Cowand Calf
St Davids Head
Milford
Swansey
Bristol
Caldy Ilse
Lundy Ilse
Mort Bay
Hartland Point
Barnstaple Bay
Ilfracombe
Foreland
Torbay
Dartmouth
Start Point
Salmon Island
Exmouth
Exeter
Bolt Head
Plymouth
Eddystone
Lands End
Scilly
Seven Stones
Guernsey
Ile de Bas
Ushant
Conquet
Beaumaris Bay
Portland
Scarns
Berwick
Newcastle
Shields
Sunderland
Hartlepool
Whitby
Scarborough
Flamboro Head
Burlington
Hull
Grimsby
Spurn
Boston
Lynn
Yarmouth
Lowestoft
Harwich
Colchester
Ryprapps
N Foreland
London
Rochester
Margate
Sandwich
Deal
Dover
Portsmouth
Isle of Wight
Hastings
Rye
Dungeness
Winchelsea
Pevensey
Beachy Head
Newhaven
Brighton
Shoreham
Arundel
Littlehampton
Bognor
Selsea Bill
Chichester
Emsworth
Portsmouth
Gosport
Southampton
Lymington
Yarmouth
Needles
Poole
Swanage
Weymouth
Portland
Lyme
Start Point
Torbay
Dartmouth
Plymouth
Eddystone
Falmouth
Lizard
Land's End
Scilly
Guernsey
Alderney
Carteret
Jersey
Cape Barfleur
Stonalees
Amsterdam
Vlie
Texel
Rotterdam
Vlaardingen
Dordrecht
Gorcum
Helvoetsluys
Brill
Goree
Flushing
Ostend
Dunkirk
Calais
Boulogne
Dieppe
Fecamp
Havre de Grace
Cape La Hogue
Cherbourg
Alderney
Guernsey
Jersey
Cape Barfleur
Stonalees
Ushant
Conquet
Ile de Bas
Seven Stones
Scilly
Lands End
Falmouth
Plymouth
Eddystone
Start Point
Torbay
Dartmouth
Exmouth
Portland
Weymouth
Swanage
Poole
Yarmouth
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Isle of Wight
Portsmouth
Gosport
Southampton
Lymington
Chichester
Selsea Bill
Bognor
Littlehampton
Arundel
Shoreham
Brighton
Newhaven
Beachy Head
Pevensey
Rye
Hastings
Dungeness
Winchelsea
Margate
Sandwich
Deal
Dover
Ramsgate
Foreland
Whitstable
Faversham
Sheerness
Queenborough
Harwich
Yarmouth
Lowestoft
Aldborough
Orford Ness
Woodbridge
Ipswich
Harwich
Colchester
Maldon
Burnham
Foulness
Sheerness
Queenborough
Faversham
Whitstable
Ramsgate
Deal
Dover
Sandwich
Margate
Winchelsea
Rye
Hastings
Dungeness
Pevensey
Beachy Head
Newhaven
Brighton
Shoreham
Arundel
Littlehampton
Bognor
Selsea Bill
Chichester
Emsworth
Portsmouth
Gosport
Southampton
Lymington
Yarmouth
Needles
Poole
Swanage
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Portland
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Eddystone
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Calais
Dunkirk
Ostend
Goree
Flushing
Brill
Helvoetsluys
Gorcum
Dordrecht
Rotterdam
Vlaardingen
Vlie
Texel
Amsterdam
10
9
8
7
6
5
4
3
2
1
0
1
2
3
4
5
56
55
54
53
52
51
50
49

I demand the Bearing and Distance of Antwerp from Flambro' Head

Answer Antwerp Bears from Flambro Head N E by E Dist 283 Miles

I demand the Bearing and Distance of Bale Island from Dover

Answer Isle de Bale Bears from Dover S W by W Distance 245 miles

I demand the Bearing and Distance of Dublin from Dunkirk

Answer Dublin Bears from Dunkirk W N W Distance 369 miles

I demand the Bearing and Distance of the Lizard from St David's Head

answer the Lizard Bears from St Davids head South Distance 123 miles

I demand the Bearing and Distance of Ostend from Mort Bay

Answer Ostend Bears from Mort Bay East Distance 29 1/2 miles

I demand the Bearing and Distance of Newcastle from the Islands of Scilly.

Answer Newcastle Bears from Scilly Islands S S W 1/2 W Distance 366 miles

I demand the Bearing and Distance of Dunkirk from Whitby

Answer Dunkirk Bears from Whitby N N W 1/2 W Distance 238 miles

To make a Mercator's Chart

Take a large Sheet of paper and down its Edges on each Side draw Columns for the Longitude and Latitude; on these at the Top and Bottom set off the Longitude from any Scale of Equal parts at pleasure: Seek the Meridional parts for every degree of Latitude you Intend to have on your Chart: and, taking these from the same Scale, set them on your right and Left hand Columns. Thro every Degree every 5 or 10 Degrees, draw Lines of Latitude and Longitude: By these set off a proper Number of Capes Head Lands Bays & thro which draw the Sea Coast and having made a Compass in some void part of your Chart it is done.

To find the Course and Distance between any two places by a Mercator Chart.

Draw a line between the two places and a nother line parralell there to that thro the Centure of your Compass, which will represent the Bearing of the two Places. Take the Difference of Latitude from your Long. Column and laying a rule over the two places set one point of your Compasses on such a part there of that the other point may exactly fall upon some East or West Line: Observe where that line cuts your Distance line for the Distance between that point and the place where you set the first foot of your Compasses when measured on the meridian or Long. Column will shew you in Degrees and Minutes the Distance Sought.

When both the places are in the same Long their Diff. of Latitude will be the Distance.

When both the places are in the Latitude take the Distance between them in your Compasses and measure it on your Latitude Column so the one point of your Compasses may fall as far to the Northward of the two places as the other does to the Southward.

Corvo
Flores
Graciosa
Whale Fish
Fyal
Pico
St George
Tercera
Formigas
Sonaria
Corrected.
Madeira West End
Santo Porto
Salvages
Allagranza
Lancerota
Palma
Ferro
Gomero
Canari
Cape Bojador

Seven Stones
Scilly Isles mid Ile

Isle of Wight
Bill point
Coast stone

Calis
Deppe
Point Ailly

Isle de Caux

Ushant
Conquet
Seains
Westpennark

Cape Berthaume
Point
Belle Isle
Sables d'Olonne

Hieys Isle
Isle de Beymiers
Isle of Oleron
Rochel

Bourdeaux
St Sebastian
Bilboa

Cape Finisterre
Cape Ortegal
Cape Prior
Oporto

Burlings
Cape of Lisbon
Lisbon

Cape St Vincent
Cape St Maria

Cape Spartel

Cape Trafalgar

Cape Gata

Cape Palos

Cape de Gatt

Cape Carbon

Cape de Gatt

Minorca
majorca

Alicant
Formentera
Capt Paul

Cape St Sebastian

Cape St Martin

Cape de Nice

Cape Delle

Marseilles
Toulon
Genoa
Leghorn
Civita Vecchia
Rome

Capha
Bona
Chrich

Corsica
Sardinia

Cape Corse

Cape Teulada

Cape Spartivento

Cape Bon

Cape Carthage

Cape Zebeb

Cape Serra

Cape Blanco

Cape Tenes

Cape Bec de Fer

Cape Roux

Cape Rosa

Cape Tabarca

Cape Palos

Cape de Gatt

Corvo
Flores
Graciosa
Whale
Fish
Fayal
Pico
St George
Pico
Tercera
Formigias
Sonaria
Corrected.
Madeira West End
Santo Porto
Salvages
Allegranza
Palma
Lanciarota
Ferro
Gran
Fortaventura
Canari
St Eno
Gomero
Cape Ghir
Cape Bojador
Cape Espadarte
Seven Stones
Scilly Islands
Isle of Wight
Beachy Head
Calais
Boulogne
Ushant
Conquet
Seains
Westpermarch
Isle de Bas
Belle Isle
Noirmoutier
Hieros Isle
Isle de Beymiers
Isle of Oleron
Rochel
Bourdeaux
St Sebastian
Bilboa
Cape Finas
Cape Ortegal
Corunna
Cape St Vincent
Oporto
Burlings
Cape of Lisbon
Lisbon
Cape St Vincent
Cape St Mary
Gibraltar
Cape de Gatt
Alicant
Cape Palos
Carthagena
Malaga
Cape Tenez
Cape Gallo
Cape Bona
Algiers
Cape Matifou
Bona
Cape Rose
Cape Roux
Cape Negro
Tabarca
Bizerta
Cape Blanco
Cape Carbon
Cape de Gatt
Minorca
Majorca
Marseilles
Toulon
Genoa
Leghorn
Civita Vecchia
Rome
Corsica
Elba
Capraia
Gorgona
Monaco
Nice
Cape Cavalaire
Cape Sicie
Cape Couronne
Cape Croisette
Cape Morgion
Cape Carbonara
Cape Spartivento
Cape Teulada
Cape Falcone
Cape Caccia
Cape Mele
Cape Cervera
Cape Orlando
Cape Passaro
Cape Scalambri
Cape Scaramia
Cape Spada
Cape Bianco
Cape Misurata
Cape Tripoli
Cape Mesurata
Cape Bona
Cape Zibeb
Cape Serra
Cape Tabarca
Cape Negro
Cape Rose
Cape Roux
Cape Cavalaire
Cape Sicie
Cape Couronne
Cape Croisette
Cape Morgion
Cape Carbonara
Cape Spartivento
Cape Teulada
Cape Falcone
Cape Caccia
Cape Mele
Cape Cervera
Cape Orlando
Cape Passaro
Cape Scalambri
Cape Scaramia
Cape Spada
Cape Bianco
Cape Misurata
Cape Tripoli
Cape Mesurata
Cape Bona
Cape Zibeb
Cape Serra
Cape Tabarca

I demand the Bearing and Distance of Corvo from the Lizard

Answer Corvo Bears from the Lizard S W ½ W Dist 12 46 miles

I demand the Bearing and Distance of Cape Bona from Barcelona

Answer Cape Bona Bears from Barcelona S E ½ E & Distance 464 miles

I demand the Bearing and Distance of Cape Trefalgar from the Isles of Scilly

Answer Cape Trefalgar Bears from Scilly Islands S ½ E Dist 630 miles

I demand the Bearing and Distance of the Isles of Flores from the Burlings

Answer Flores Bears from Burlings West Distance 994 miles.

I demand the Bearing and Distance of Cadiz from the Isle of Madeira

Answer Cadiz Bears from Madeira E ½ S Distance 615 miles

I demand the Bearing and Distance of Gibraltar from Genoa

Answer Gibraltar Bears from Genoa S W ½ W Distance 792 miles

I demand the Bearing and Distance of the Lizard from Cape Finisterre

Answer the Lizard Bears from Cape Finisterre S S W ½ W Dist 443 miles

Directions for keeping a Journal.

Before all things you are to find the Bearing and Distance of the Port you are bound to; and if their be any Capes Headland, Islands or Harbours you desing to make in your way thither find the Bearing and Distance of that you expect to touch at first.

Then Having ruled Six Columns: In the first of these you must place the Hours when you heave the Log which is commonly once in every two Hours: remembring always to begin your day at noon. In the Second you place the Knots of the Log Line veer'd out in half a minute: and in the third the odd Fathoms, or ½ Knots & Quarter Knots: In the fourth is placed your several Courses Steered that day. In the fifth you set the wind and weather and in the sixth and last you put down your remarks of every thing meterial done on Boa'rd. and indeed all this is no more than transcribing the Log.

as for the Log every Knot thereof should be divided into 10 fathoms each consisting of 5 feet that so you may use the fathoms as Decimals or Tenths after the Knots But if (as is generally the Case) every Knot be divided only into 7 fathoms each 6 foot distant you may bring the odd Fathoms into Decimals by multiplying them by 10 and Dividing that product by 7 as for the half minute glass it Should be 32 Seconds long one Second to be allowed for turning it each way: tho it is generally made only 30 Seconds long. the better to answer the Log Lines of 52 feet to a Knot which are undoubtedly erroneous. as it is thus proved.

the Circumference of our Globe is known to be 25036 English miles Divide that by 360 the number of Degrees in every Circle and you will find the Number of English miles in one Degree to be 69 ½ Therefore say if 60 Geographical miles give 69 ½ English miles then one English miles Consisting of 1760 yards will give 2039: which is the Number of yards in one Geographical mile. Say again if in one hour or 3600 Seconds a Ship Sails 2039 yards how far ought she to move in 30 Seconds or half a minute: which you'll find to be nearly 17 yards or 51 feet: and that is the true distance their ought to be between the Knots on your Log Line.

But to proceed: proper allowances being made for Variation and Leeway you must endeavour to bring all the Courses sailed that day into one by sailing in a Plain or else where the

Difference of Latt and Departure answering to every Course and Distance and then seeking the Course and Distance corresponding to the whole Difference of Latitude and Departure as for the ye of Long you may either find it by mercator or else seek it in the Kalender by entering the Table of Difference of Latt and Departure and finding the middle Latt answering to that days work among the Degrees at the Top or Bottom; then find the Departure in the Latitude and right against it in the Distance Line stands the ye of Long made in that day.

Having now cast up your days work it must be placed in divers Columns below what you transcribed from the Log Book. In the first Column set the day of the week and Day of the month; In the Second your Course; in the third your distance in the fourth your Diff: of Latt in the fifth your Departure; in the Sixth your Latt in: In the Seventh your Diff: of Long and in the Eight your Longitude in.

You are to remember and take the Variation once every 2 or 3 days and to be sure to neglect no opportunity of Observing the Latt when ever the Sun is to be seen at Noon and these you are to put down in the margin among your Remarks.

If the Last by Observation differ more than 20 miles from your Latt by account you have made some mistake in your Journal which to Correct observe the following Directions

1 Consider if there have been a Current & Observe which way it sets, and see if that will not bring your Journal to right

2 If that will not do see if you have made a mistake in allowing for the Variation and Leeway and have steered a wrong Course for one or two days or more. —

3 But if you cannot think the fault is in any of these then you must correct by your Distance; and Conclude there has been some Error in the Log. —

When a Ship Sails within 3 points of the meridian we generally Suppose the Error to be in the Distance and on the Contrary when she sails within 3 points of an East or West Line it is usual to Suppose the Error to be in the Course. —

A Journal of a Voyage by Gods Permission
In the Lawell of Hubby & Commanded Bound from
the Lizard for Madeira Kept by me I Barker. —

Lizard Latt 49°57'N Long 05°14'W
madeira Latt 32°23'N Long 17°26'W

Our Course from the Lizard for Madeira is S 27°21'W Distance
1167 miles.
Our Course from the Lizard for Cape Finisterre is S 25°19'W Dist 468 miles.

M	K	FK	Courses	Winds	Remarks on Decem^{r} 19th 1759
2					
4					
6					Lizard NNE dist 10 Miles
8	4	.	South	NNE	Variation 1½ pt Leeway
10	4	1			
12	5	.			
2	5	.			
4	4	1	SW		
6	5	1			
8	5	.			
10	6	.	WSW		at Noon Cape Finister Bore S 58W
12	4	1			Distance 356.2 miles.

		Course	Distance	x of Latitude N	x of Latitude S	Dep^{t} E	Dep^{t} W	Lat^{d} in North	x of Long^{e}	Long^{e} in West
By the Log		S 13½ W	46 8 miles		452		20.6	47.32	00.51	05.15

M	K	FK	Courses	Winds	Remarks on Decem^{r} 20 1759
2	4	1	WSW	NNE	Variation 1½ pt Leeway
4	5	.			
6	5	1			This 24 Hours moderate
8	6	.	West	NNW	Leeway 1 pt weather and nothing
10	6	1			remarkable
12	6	.			
2	5	.			
4	5	1	SWbW		Leeway
6	5	.			
8	6	.			
10	6	1	SW	NW	at Noon Cape Finister Bore S 58W½W
12	6	.			Distance 245 miles.

		Course	Dist	x of Latitude N	x of Latitude S	Dep^{t} E	Dep^{t} W	Lat^{d} in North	x of Long^{e}	Long^{e} in West
By the Log		SWbS 5/4 W	131 miles		487		97.3	47.03	2.25	08.10 West
								47.05		

H	K	HK	Courses	Winds	Remarks on Decm^{d} 21th 1759
2	5	1	SW	NW	Variation 1½ pt Leeway 0
4	55	.			
6	56	.			
8	56	.			
10	6	1		WNW	Leeway 1 pt
12	6	.			True azimuth 13° 36 S to the East
2	5	.			magg^{c} azimuth 22° 30 S to the East
4	55	1			Variation 16° 06 W
6	55	.	SW	West	This 24 Hours fine Weather at 6 AM hauled up
8	5	1			our mainsail in the Brails for the Ships astern
10	4	1			at Noon Cape Finister Bore S½W
12	4	.			Distance 131 miles.

			Courses	Distance	☉ of Latitude N	☉ of Latitude S	Departure E	Departure W	Latd in North	☉ of Long W	Longitude in
			SSW	124 miles		119.7		30.0	45°03	00°43	6°58W

H	K	HK	Courses	Winds	Remarks on Decm^{d} 22th 1759
2	4	.	SSW	West	Variation 1½ pt Leeway 1 pt
4	55	.			
6	56	.			
8	6	.	WNW	SW	This 24 Hours fine Weather at
10	5	.			6 AM set our mainsail and
12	54	.			reefed our Topsails and forted
2	4	.			mizen Topsails and stowed jib
4	4	1			
6	55	1	SSE		
8	55	.			
10	4	1			
12	5	.			at Noon Cape Finister Bore SSW½W Dis 73 miles

			Course	Distance	☉ of Latitude N	☉ of Latitude S	Departure E	Departure W	Latd in North	☉ of Long W	Longitude in
			SSW	73 miles		41.1		10.1	44°22	00°19	9°12West

H	K	HK	Courses	Winds	Remarks on Decm^{r} 23 1759
2	5	.	SSE	SW	Variation 1½ pt Leeway 1 pt
4	56	1			This 24 fresh of wind as per Columns
6	6	.			at 4 PM set our mizen Topsail
8	6	1	WNW		reef and fit our ship rather falling a
10	7	.			stern and at 8 PM let the
12	7	.			reef out of our main Topsail
2	6	1			
4	6	.			
6	56	1	WSW	South	
8	56	.			
10	5	.			at Noon Cape Finister Bore SSE½E
12	4	1			Distance 86 miles

			Course	Dis	☉ of Latt N	☉ of Latt S	Departure E	Departure W	Latd in	☉ of Long	Long in
			SSW	76 miles		21.6		72.7	44°01	1°44	10°56W
									44°30		10°30W

H	K	MK	Courses	Winds	Remarks on Decm 24 1759
2	5	.	WSW	South	Variation 1½ pt Leeway 1 pt
4	55	1			
6	55	.			This 24 Hours fine Weather
8	56	.	SSE		and nothing material happened
10	6	1			
12	6	.			at 2 AM set our maintopgallant sail and
2	55	.	WSW		at 3 hoisted it again the wind & ather increasing
4	55	1			
6	54	1			
8	54	.		NW	
10	53	.			at Noon Madeira Bears SSW½W Distance
12	53	1			76 B.S miles

			Courses	Distance	Dr of Latitude N	Dr of Latitude S	Departure E	Departure W	Latd in North	Dr of Long W	Longd in
			SWbS¼W	55 miles		44.4		32.9	43°46	00°47	11°17 W

H	K	MK	Courses	Winds	Remarks on Decm 25 1759
2	4	.	WSW	NW	Variation 1½ pt Leeway 1 pt
4	4	1			
6	5	.			This 24 Hours moderate weather
8	56	1			
10	56	.	SW		Leeway 0
12	6	1			
2	7	.			at 6 a m let the reef out of our fore
4	7	1			Topsail and Mizen topsail it blowing
6	7	.			fresh Wind
8	76	1	SSW		
10	6	.			at Noon Madeira Bears SSW Distance 60 4 miles
12	5	1			

			Course	Distance	Dr of Lat N	Dr of Lat S	Departure E	Departure W	Latd in North	Dr of Long West	Longd in
			SSW½W	138 miles		125.2		59.7	41°41	01°21	12°38 W

H	K	MK	Courses	Winds	Remarks on Decm 26 1757
2	55	.	SSW	NW	Variation 1¼ pt Leeway 0
4	56	1			
6	56	.			Sune amplitude 31°49 S
8	6	1	SW	NNE	mag amplitude 17°30 S
10	7	.			Variation 14°19 W
12	7	1			This 24 Hours fine Weather and a fresh
2	6	1			of wind as per Column at 4 AM set
4	7	.	SWbS		our maintopgallantsail Carried at 5 set
6	56	1			fore topgallantsail
8	6	.			at Noon Madeira Bore SSW Distance 56 miles
10	56	.			
12	6	1			

			Course	Distance	Dr of Latitude N	Dr of Latitude S	Departure E	Departure W	Latd in North	Dr of Long West	Longd in
			S21W	146 miles		136.3		52.3	39°25	01°01	13°49 West

M	K	HK	Courses	Winds	Remarks on Decemb^{r} 27 1759
2	6	1	SWbS	NNE	Variation 1/4 pt Leeway 0
4	6	.			This 24 Hours fine Weather at 4 AM
6	5	1			Sch main topmast studsail and a-h
8	6	.	SWbW		b Sch fore topmast Do
10	5	1			
12	5	.			
2	4	1	SW		
4	5	1			
6	5	.			
8	6	.	SSW		
10	6	1			
12	6	.			at Noon Madeira Bore SbW 3/4 W Distance 26 Comiles

	Courses	Distance	Diff of Latd		Departure		Latd in	Diff of Long	Longd in
			N	S	E	W		W	
	SbW	132 miles		120.7		55.1	87 00 24	01 00 10	14 00 59 W
							36:50		15 00 21 W

H	K	HK	Courses	Winds	Remarks on Decm^{r} 28 1759
2	5	1	SbW	NE	Variation 1/4 pt Leeway 0
4	5	.			
6	5	1			
8	6	.	SWbS		
10	6	1			
12	7	.			
2	6	1	SW		
4	6	.			
6	7	.			
8	6	.	WSW		
10	5	.			
12	4	.			at Noon Madeira SbW 1/2 W Distance 152 miles

	Course	Distance	Diff of Latd		Departure		Latd in	Diff of Long	Longd in
			N	S	E	W		W	
	S 27 W	135 miles		119.7		61.9	84 00 50	01 00 16	16 00 57 W

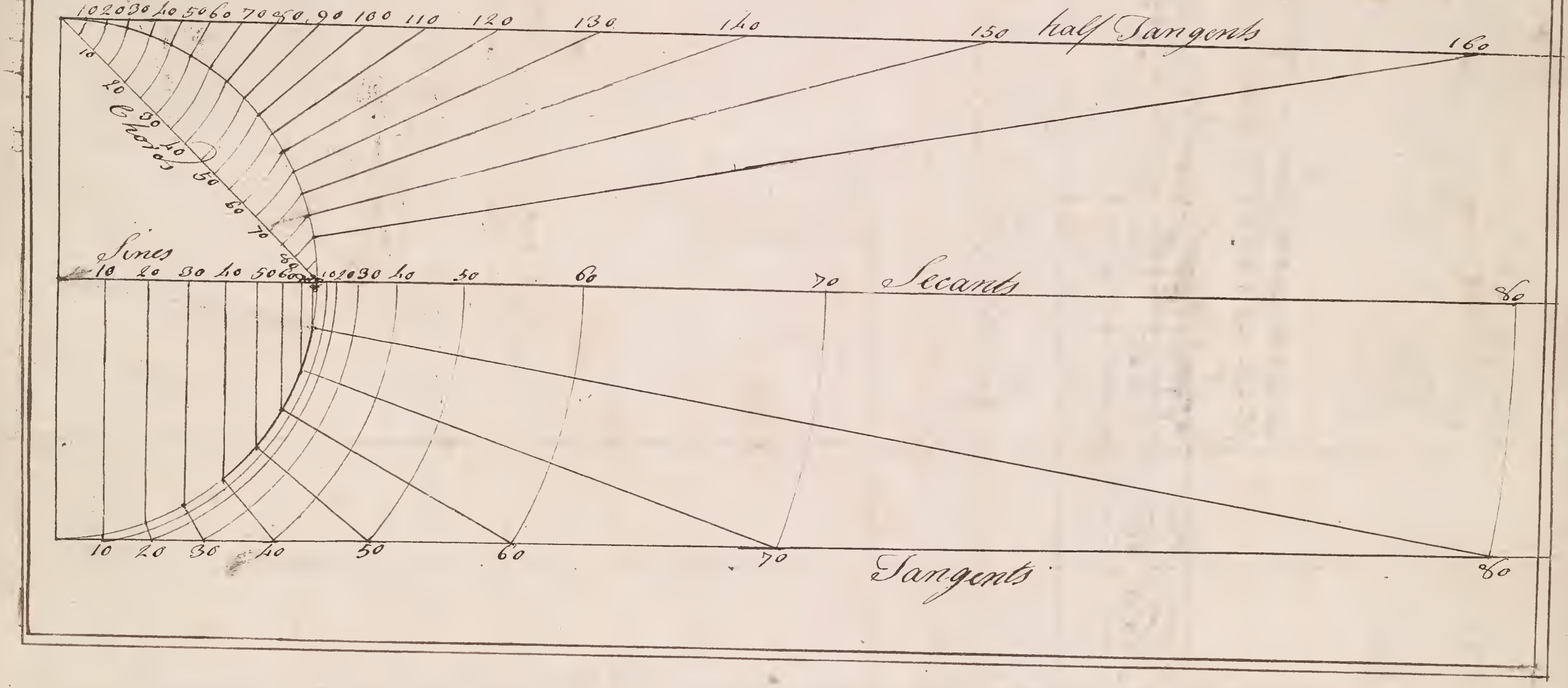
M	K	HK	Courses	Winds	Remarks on Decm^{r} 29 1759
2	4	1	WSW	NE	Variation 1/4 pt Leeway 0
4	5	.			
6	5	1			
8	6	.	SSW		
10	6	1			
12	7	.			
2	7	1			
4	8	.	South		
6	7	.			
8	6	.			
10	5	.			
12	5	1			at Noon Madeira Bore WSW 3/4 W Distance 66 miles

	Courses	Distance	Diff of Latd		Departd		Latd in	Diff of Long	Longd in
			N	S	E	W		W	
	S 10 W	136 miles		65.7		23.1	02 00 36 S	00 00 24	16 00 09 W

M	K	FK	Courses	Winds	Remarks on Decm 30 1759
2	6	.	W 5 W	N E	Variation 1 pt Leeway
4	5	1			76
6	5	.			This d. nothing material. but Cousin
8	3	.	W b S		middleton for joy of seeing land eat
10	2	.			two pound of plumb Puding and
12	2	.			half a pound of Beef — — —
2	1	.	West		
4	1	.			
6	0	1			
8	5	.			at 8 am saw made wch bore
10					from us N W Distance 6 miles
12					

			Courses	Dist	Diff Lat N	Diff Lat S	Depart E	Depart W	Latt in North	Diff of Long W	Longitude	
			S 64 W	61 miles		26.6		55.0	62 11	01 05	17 14	W

End by me Jo: Barker


10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 half Tangents 160
10 20 30 40 50 60 70 80 Chords
Sines
10 20 30 40 50 60 70 80 Secants
10 20 30 40 50 60 70 80 Tangents

Spheric Geometry. 1760

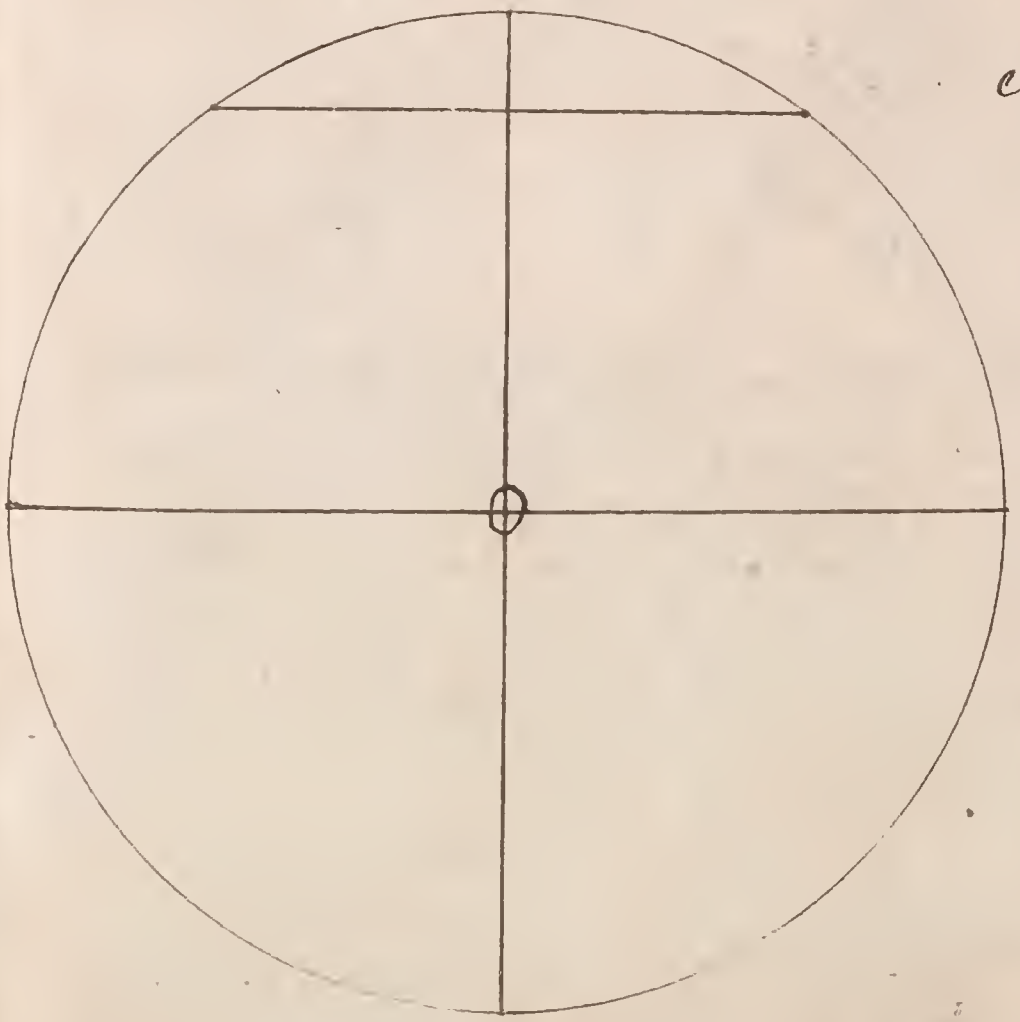
Spheric Geometry is the art of drawing Circles of the Sphere on a plain or flat Superficies; and these may be either great Circles or lesser Circles.

Great Circles are of three kinds Viz. the Primitive Circle Right Circles and Oblique Circles. The primitive Circle is that whereon the Projection is to always to be performed. Right Circles are always drawn as Diameters thro the Center of the Primitive Circle. Oblique Circles are such as cut the Primitive Circle in two opposite Points but pass not thro its Center; being in all projections drawn from the Line of Secants. Lesser Circles are ever parallel to right ones; and drawn with the Tangent Complement of their Distance therefrom.

Prob. 1 To find the Poles of any great Circle

The Poles of every great Circle falls in a Point that is every way 90° distant from it

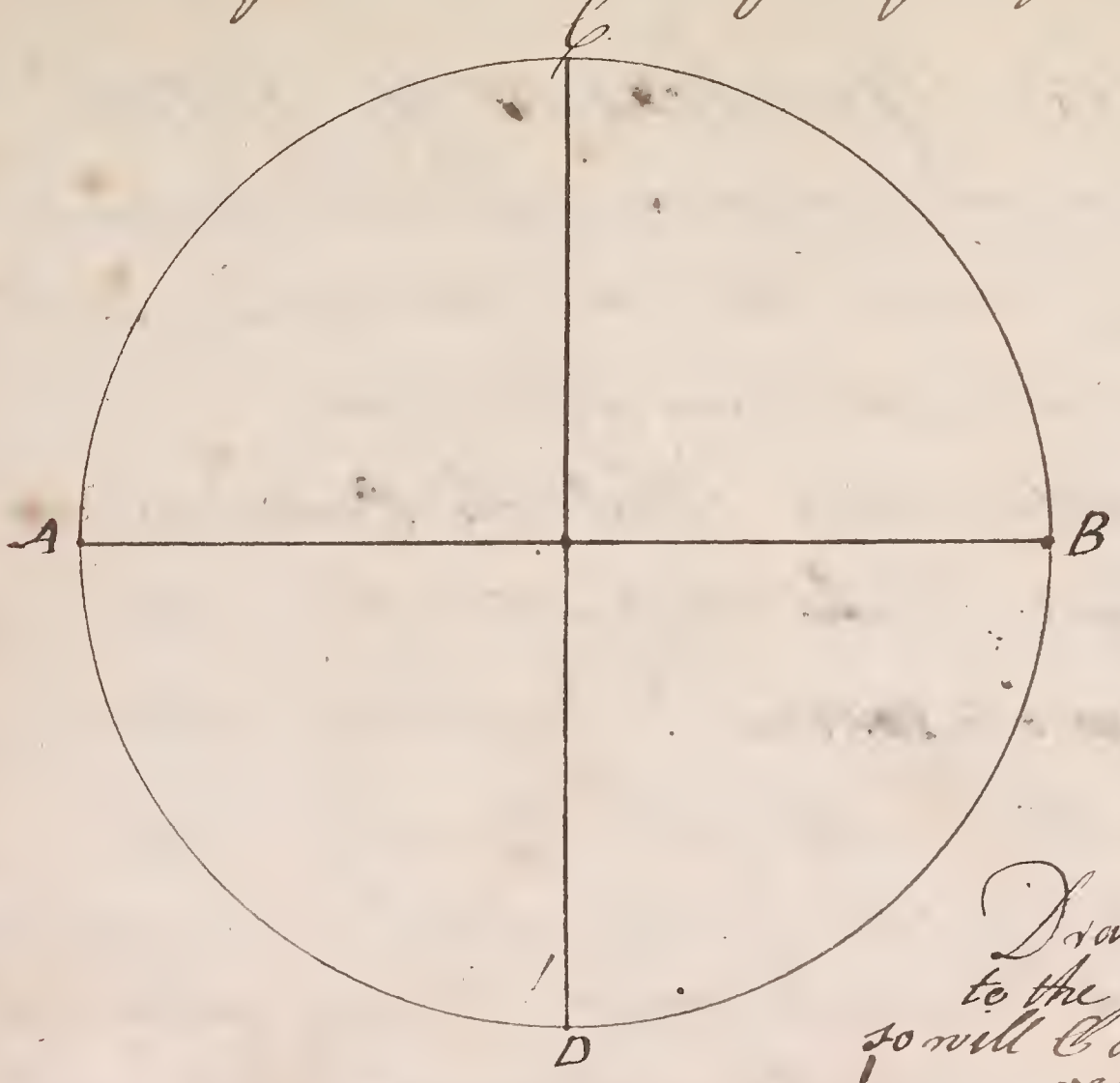
Case 1 To find the Poles of the Primitive Circle



The poles of every Primitive Circle fall at its Center

Therefore find o the Center of the Primitive Circle and it will be the Poles required

Case 2. To find the Poles of any right Circle AB



Draw C D at right angles to the given right Circle A B so will C and D be the Poles required

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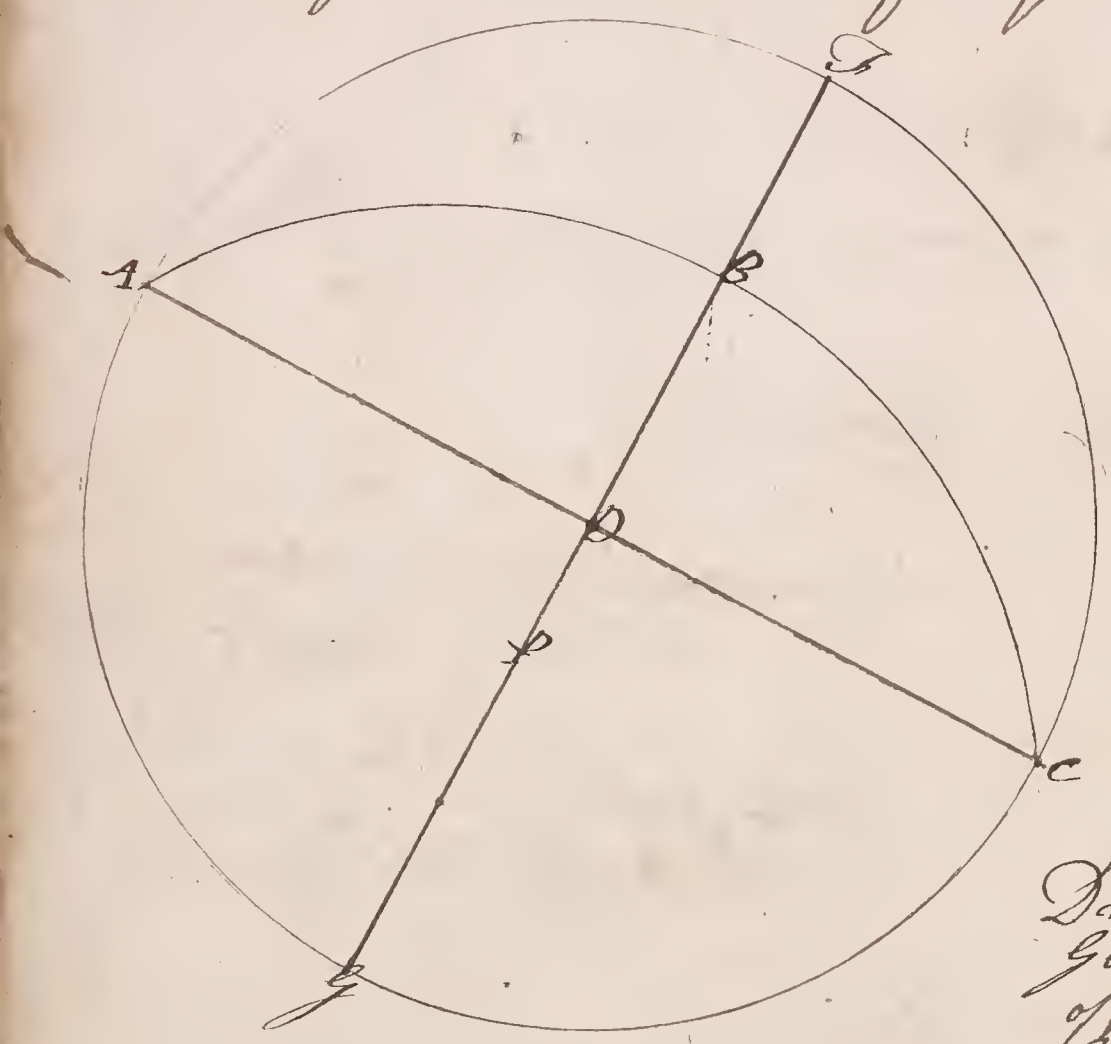
Case 3. To find the Poles of any oblique Circle a b c

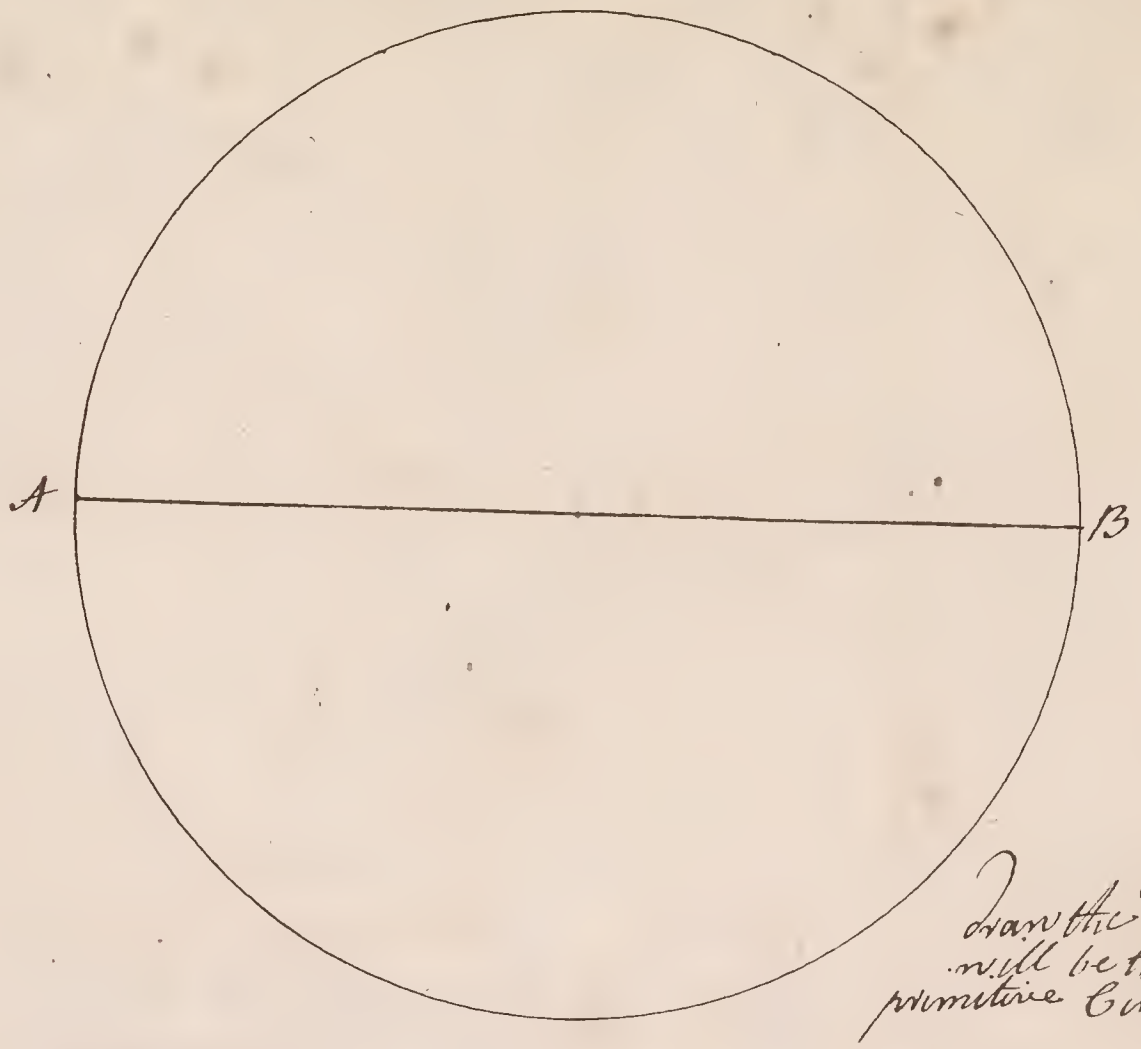


BD 90.00
5 6 1
DP 32.00

Draw a g at right angles to the Given Circle A B C then take B D of the Line of half Tangents and Subtract it from 90 and set the remainder from D to P which will be the Poles required

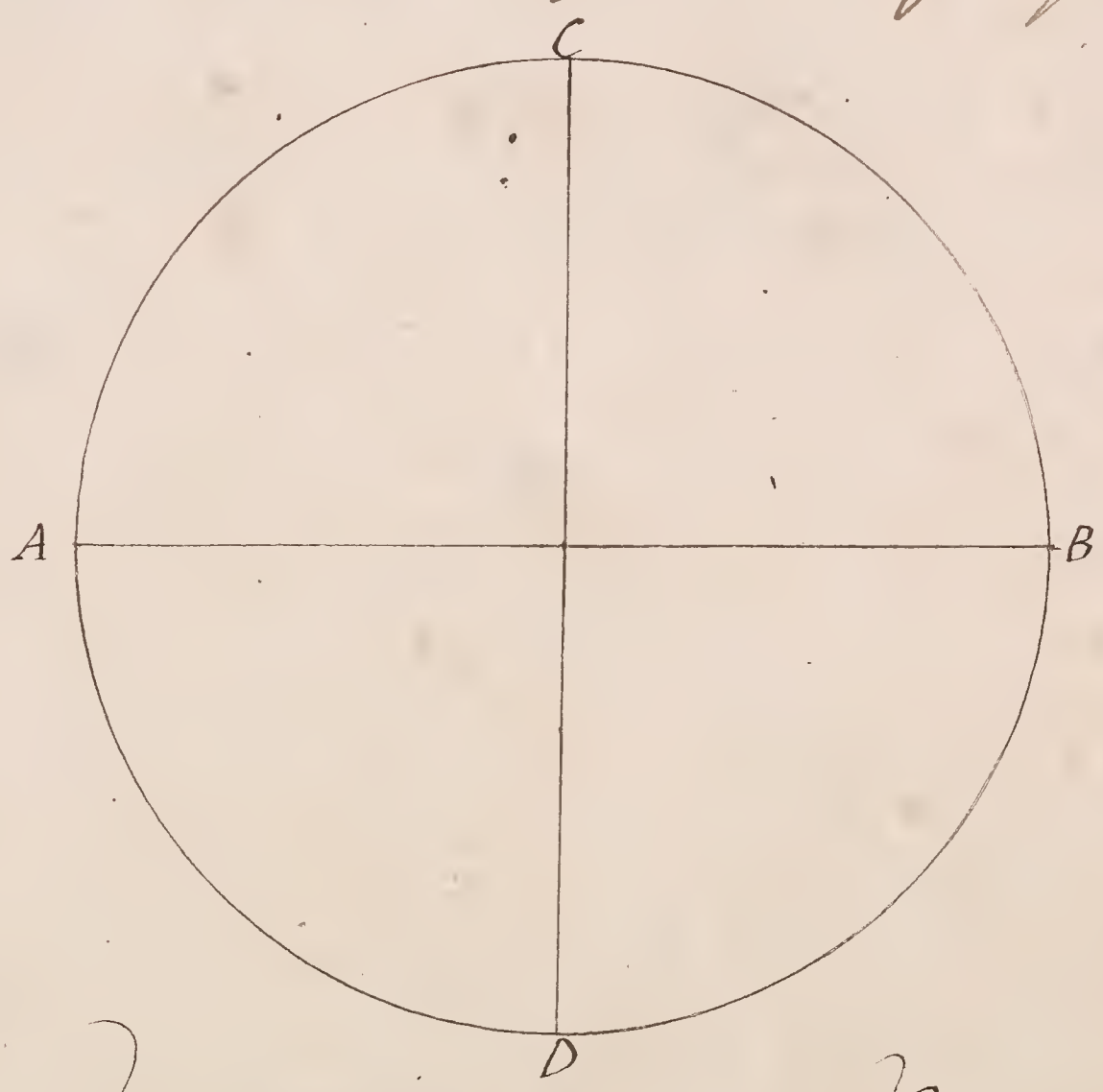
Prob 2 to draw a great Circle Perpendicular to any other great Circle

Case 1 to draw a great Circle perpendicular to the primitive Circle.



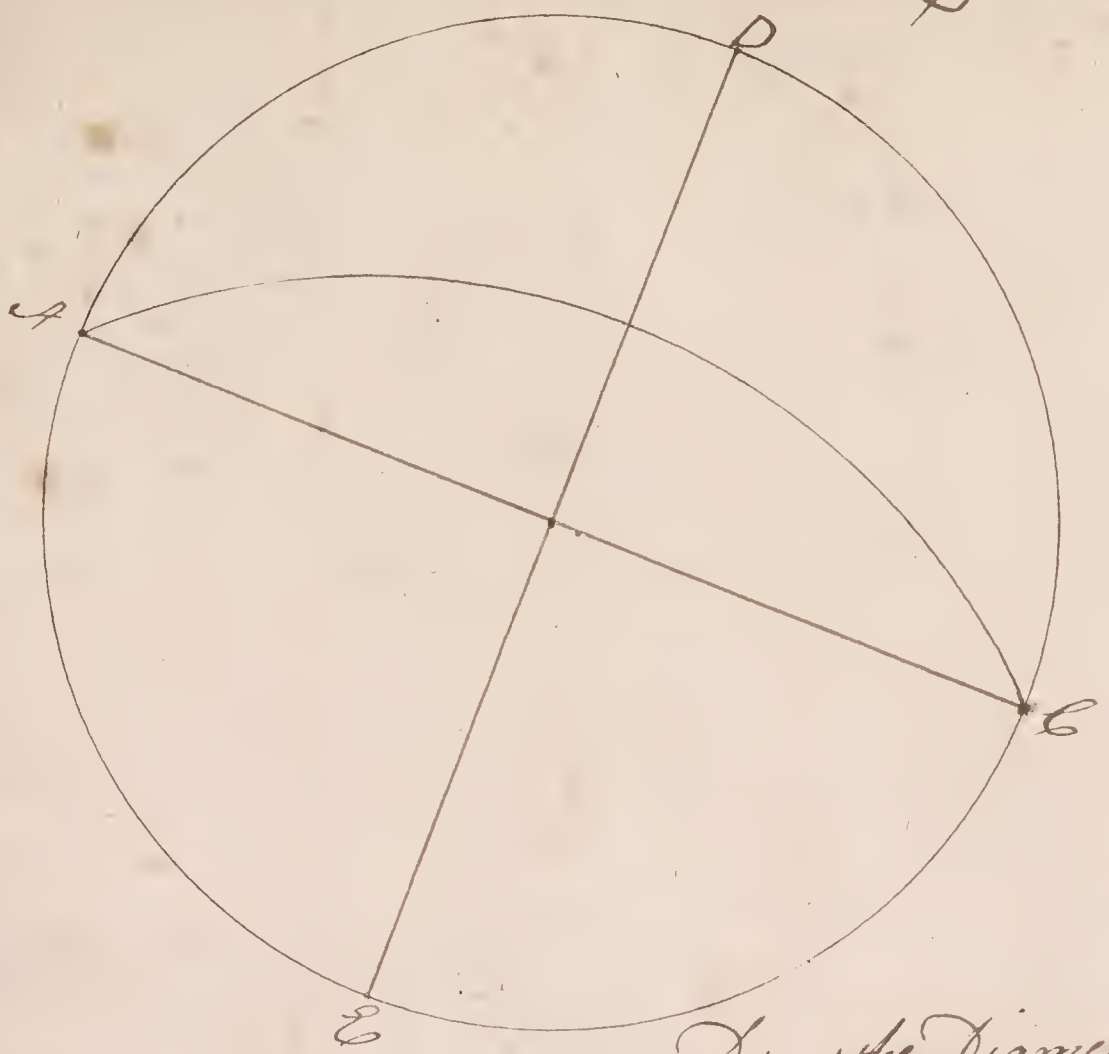
draw the Diameter AB and it will be the perpendicular to the primitive Circle required

Case 2. To draw a great Circle perp.r to any right Circle AB



draw C D at right Angles to A B and it will be the perpendicular required

Case 3. To draw a great Circle Perpt. to any oblique Circle
A B C



Draw the Diameter A C and D E at right angles thereto and it will be the perpendicular required

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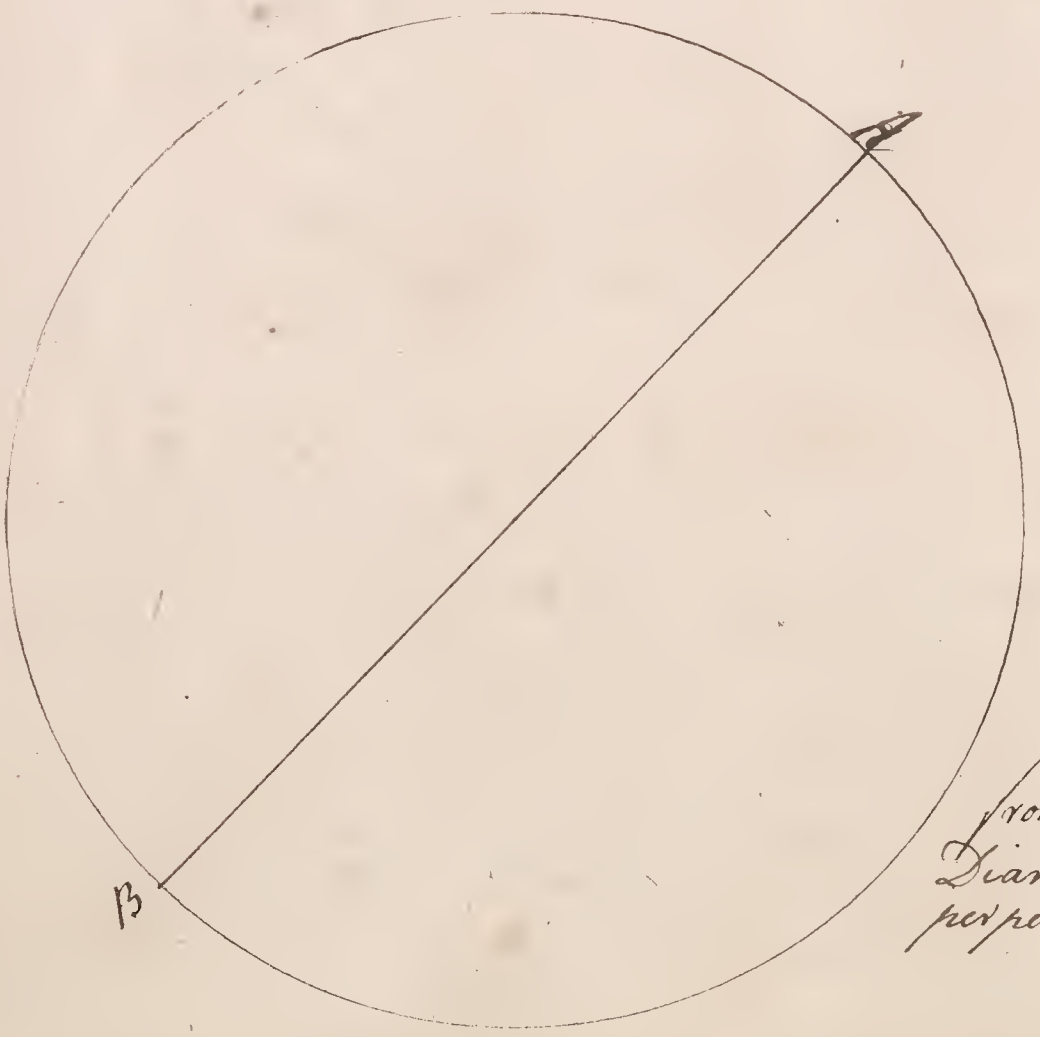
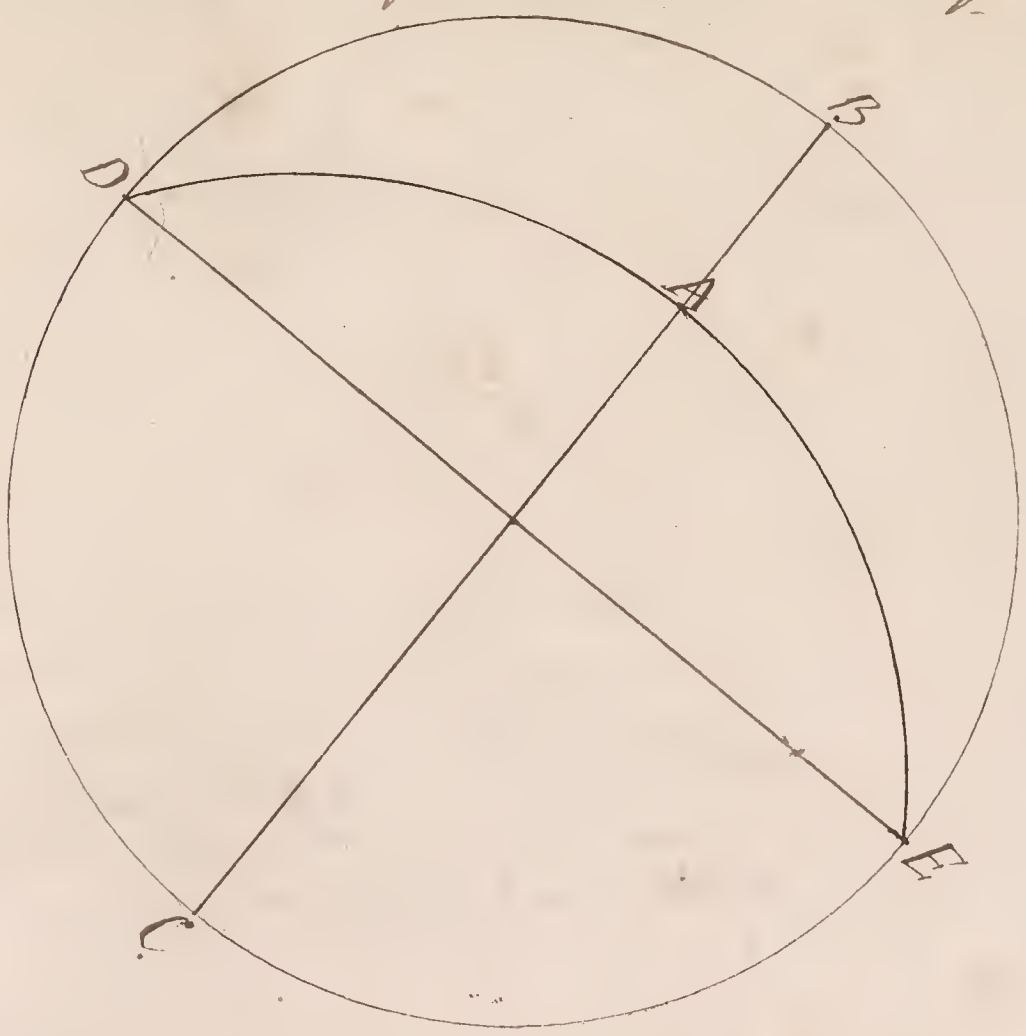
Prob. 2 Thro any given in a great Circle to draw another great Circle perpendicular thereto.

Case 1 Thro any given point A in the Primitive Circle to draw a great Circle perpendicular thereto.



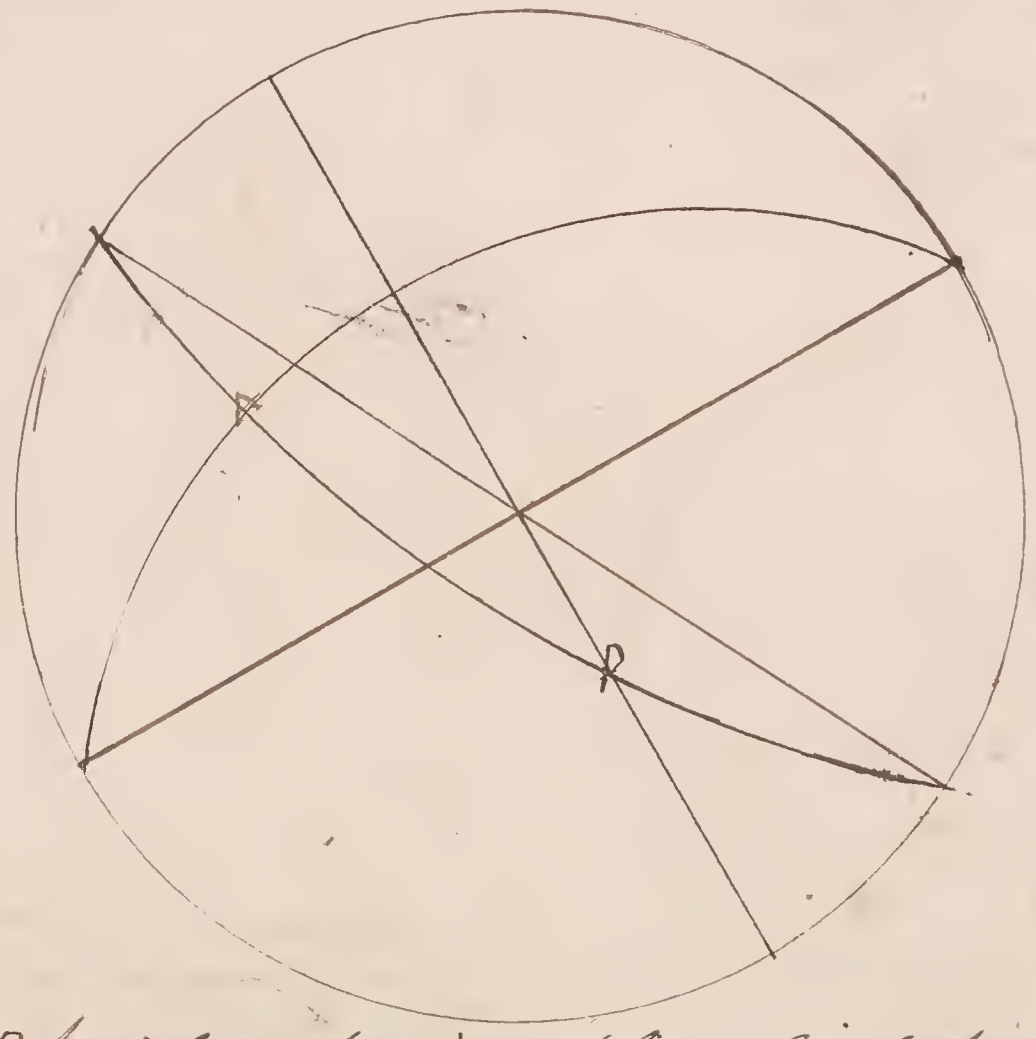
From the given Point A Draw a Diameter A B and it will be the perpendicular required

Case 2. Thro any given Point A in a right Circle to draw a great Circle Perpendicular thereto



Draw DE at right angles to the given right Circle BC then draw a great Circle thro the 3 points of DE and it will be the perpendicular required.

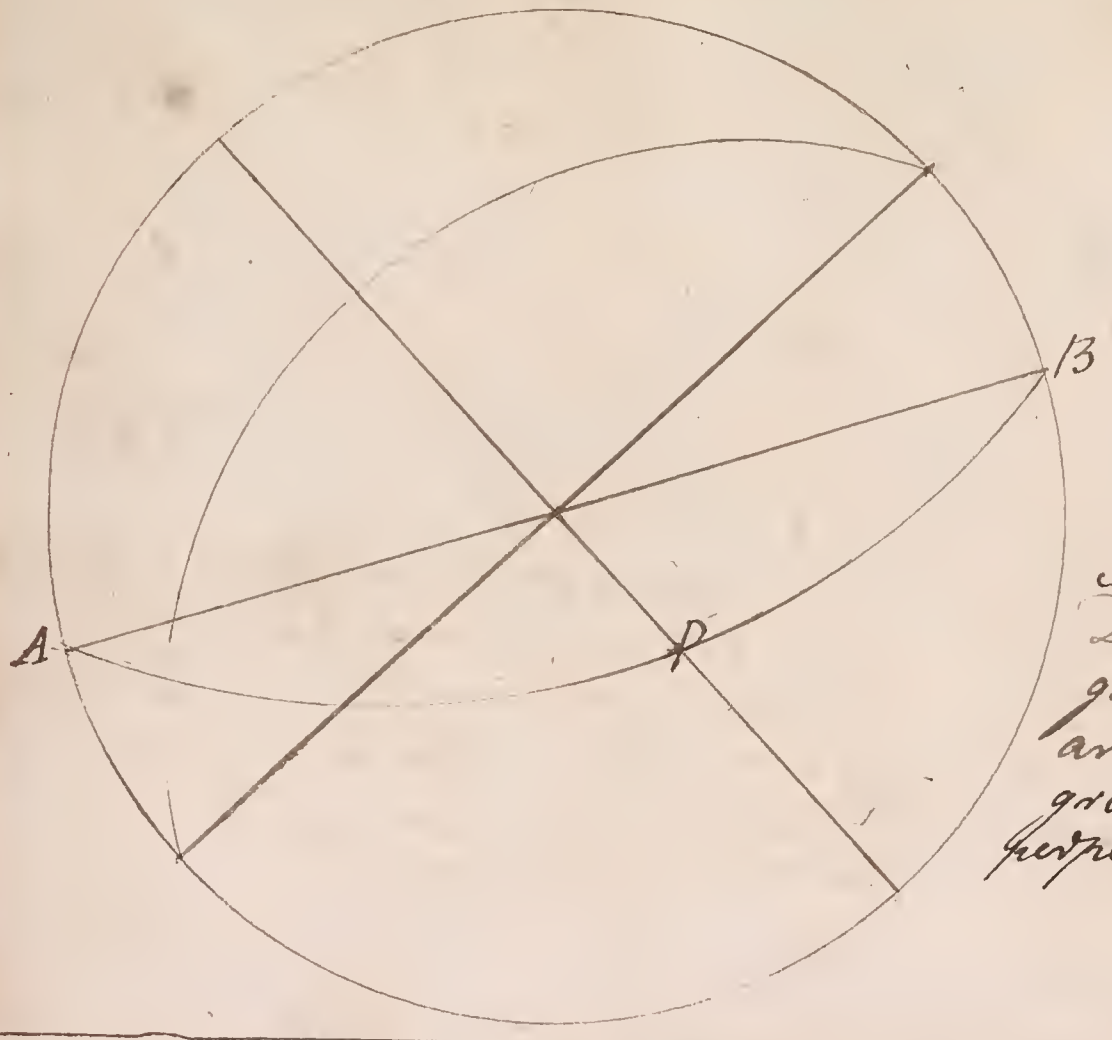
Case 3 Thro any given Point A in an Obligue Circle to ~~draw a great Circle~~ perpendicular thereto



90 00
52 00
36 00

Find P the Poles of the given obligue Circle through which and the given point A Describe a great Circle and it will be the perpendicular required

Prob 4 To let fall a Perpendicular upon an Oblique Circle from any given Point in the Primitive Circle. Suppose A

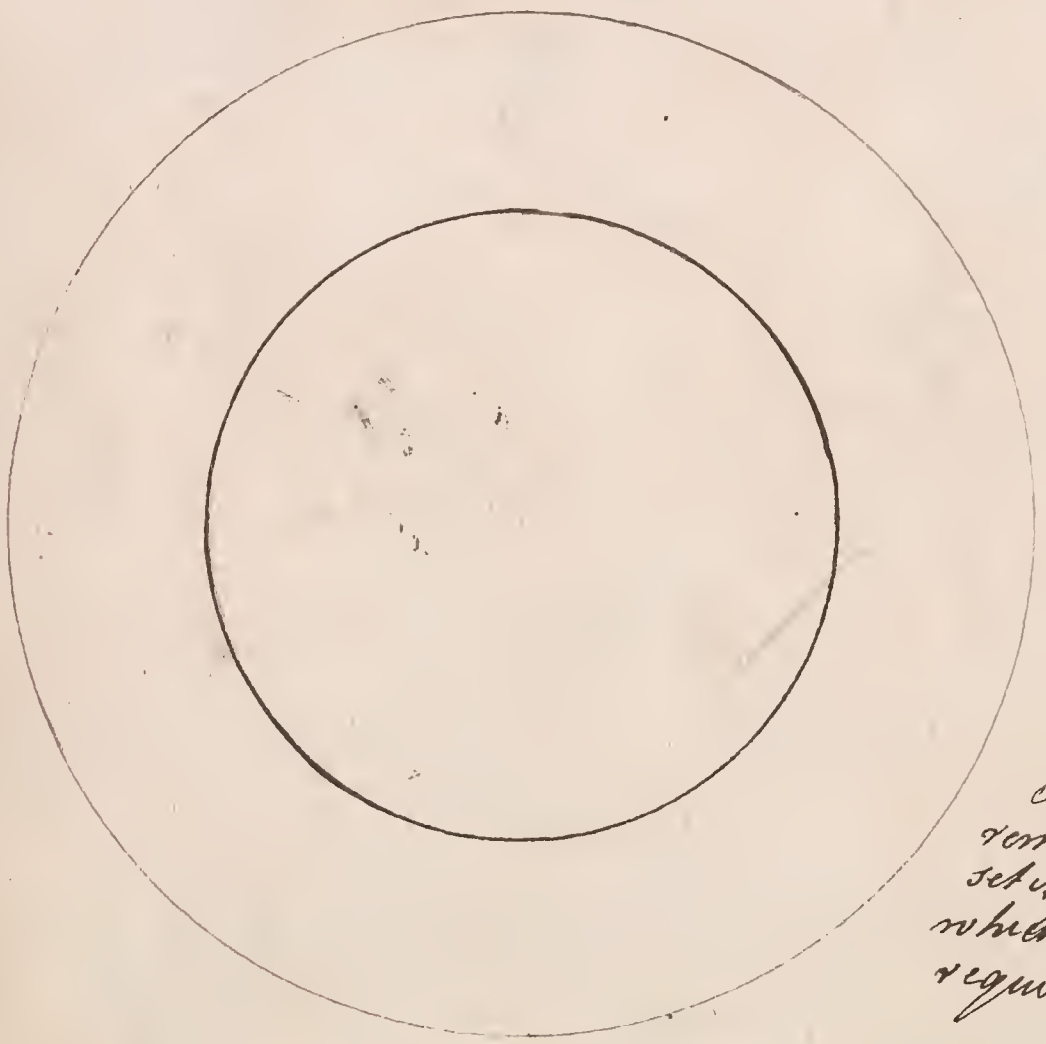


90°00
52°00
36°00

From the given Point A Draw the Diameter A B. Find P the Pole of the given Oblique Circle through which and the Points A & B Describe a great Circle and it will be the Perpendicular required.

Prob 5 To Draw a ~~great~~ Circle parallel to a great Circle at any given Distance there from

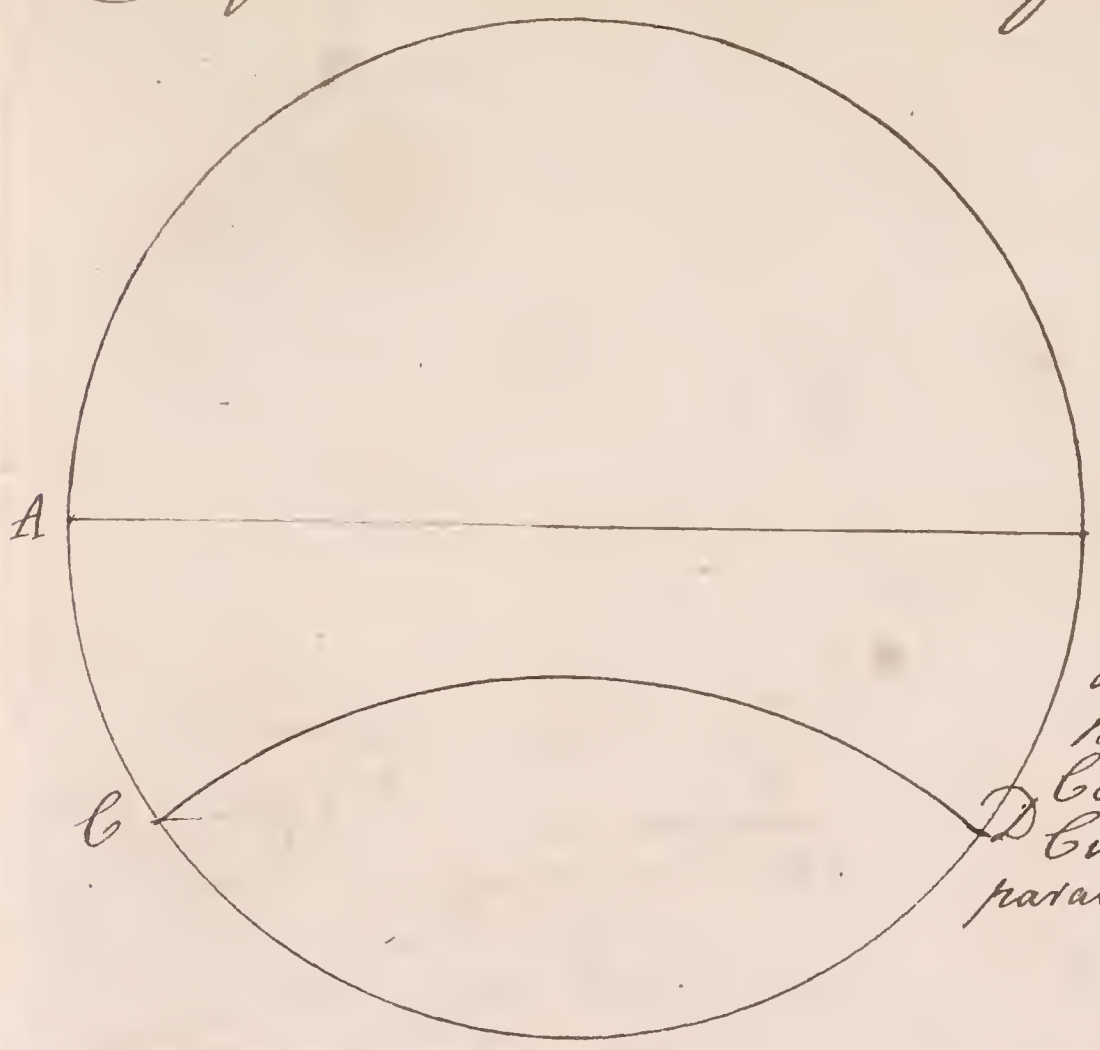
Case 1 To draw a Circle parallel to the Primitive Circle at any given Distance there from. Suppose 36°20'.



90°00
36°20
53°40

Subtract 36°20' from 90 Take the remainder off the half Tangents and setting one foot in A sweep a Circle which will be the parallel Circle required.

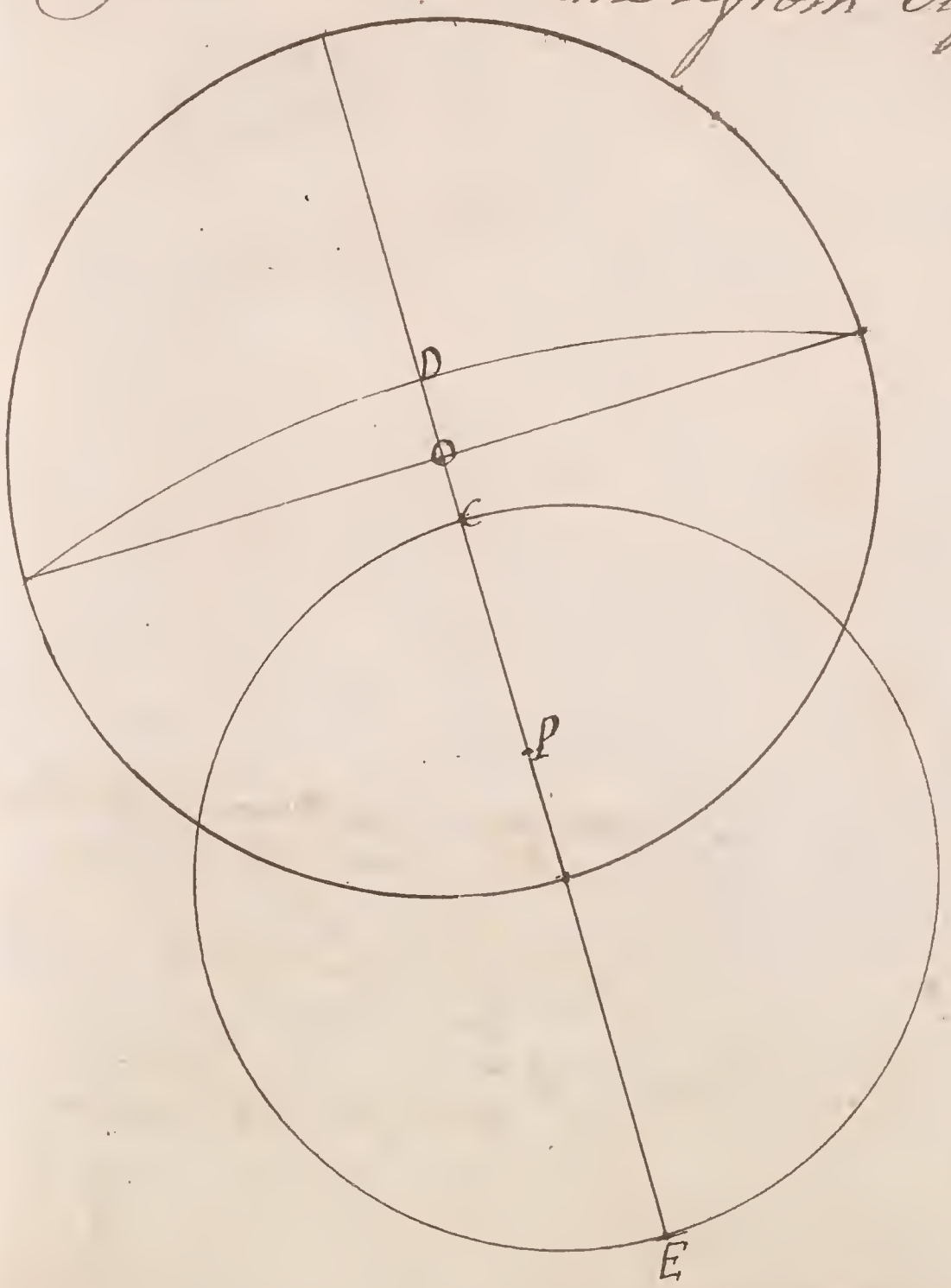
Case 2. To draw a Circle parallel to a right Circle at any given Distance therefrom Suppose 36° : 20



90°.00
36.20
53°.40

Take 36.20 from off the Chords and set it from A to C & from B to D then with Tangent Compliment thereof Draw a Circle C D and it will be the parallel Circle required.

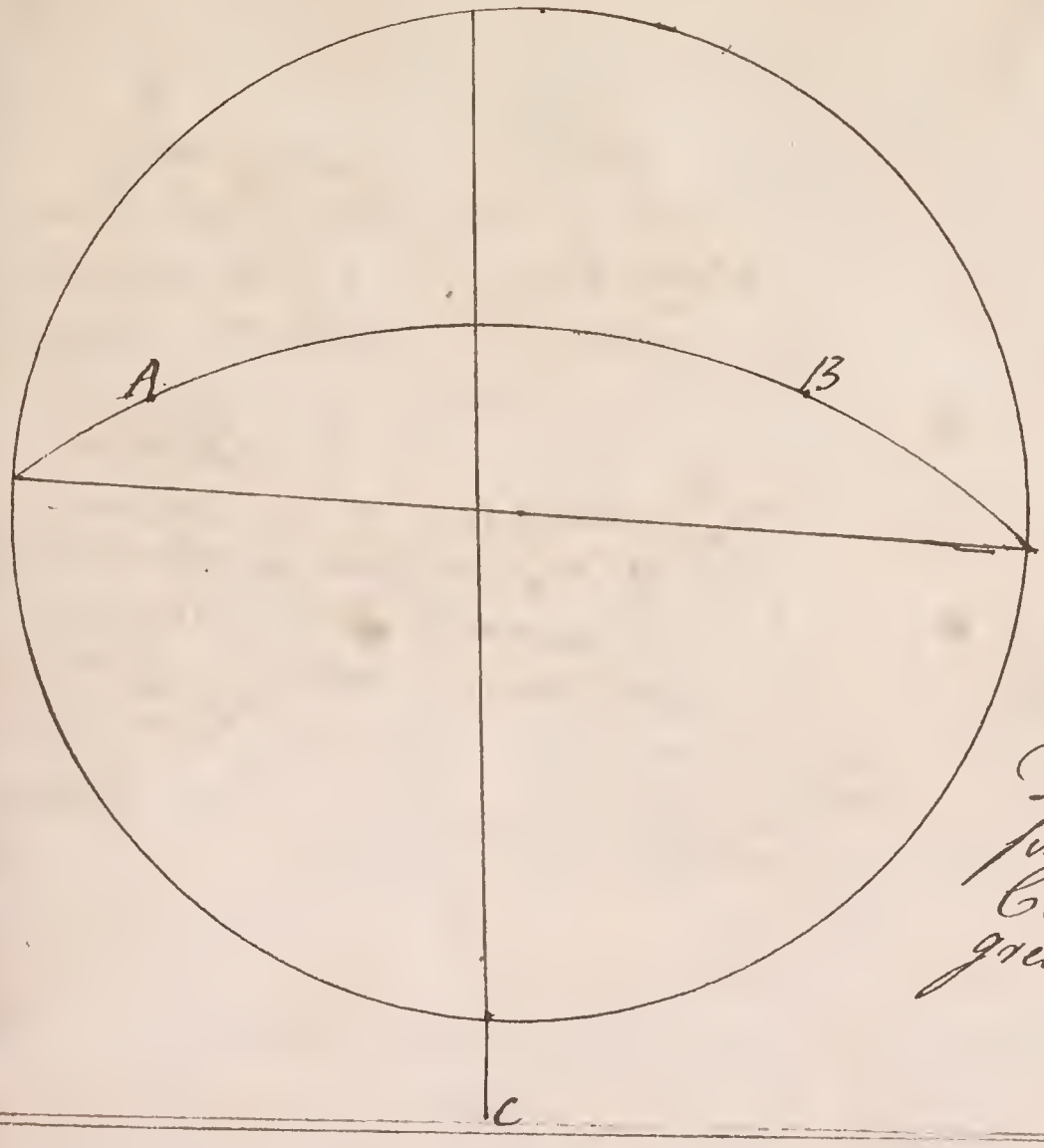
Case 3. To draw a Circle parallel to an oblique Circle at any given Distance therefrom Suppose 36° : 20



90°.00
DO 20°.00
OP 70°.00

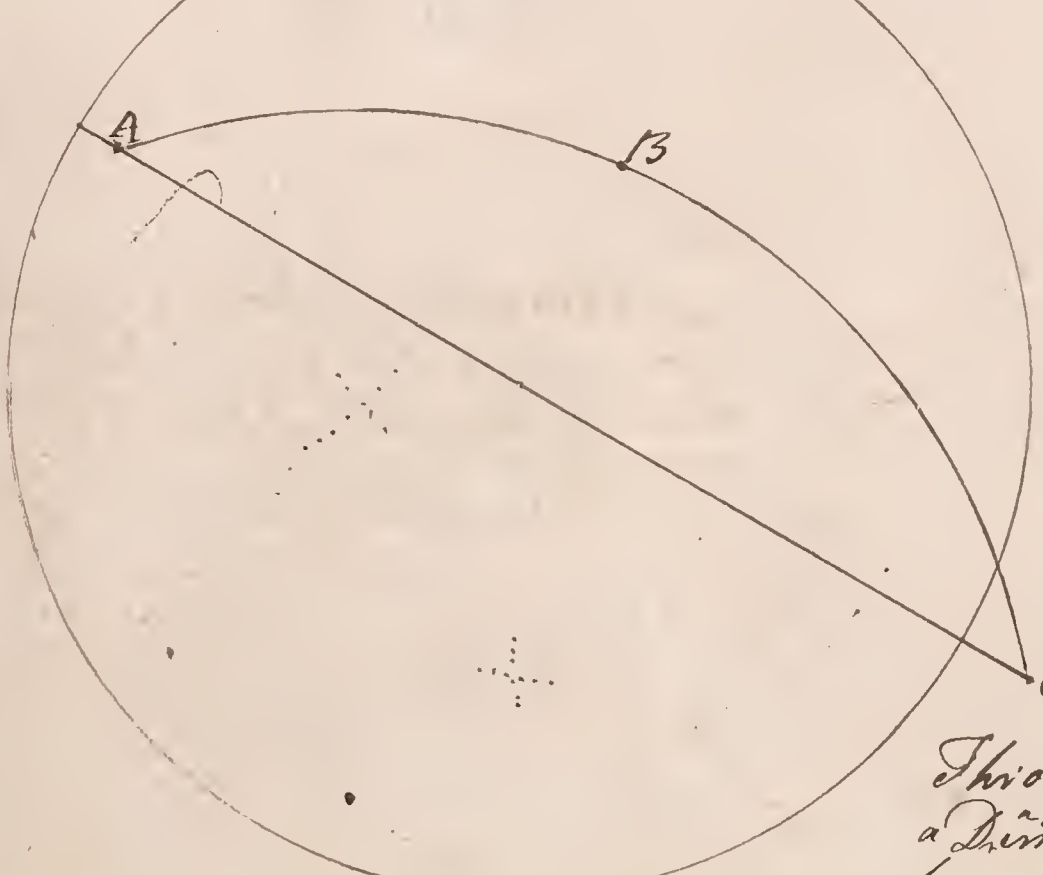
90°.00
DC 36°.20
CP 53°.40
PO 70°.00
CO 16°.20
OE 123°.40

Prob. 6. To draw a great Circle thro any two given Points A and B



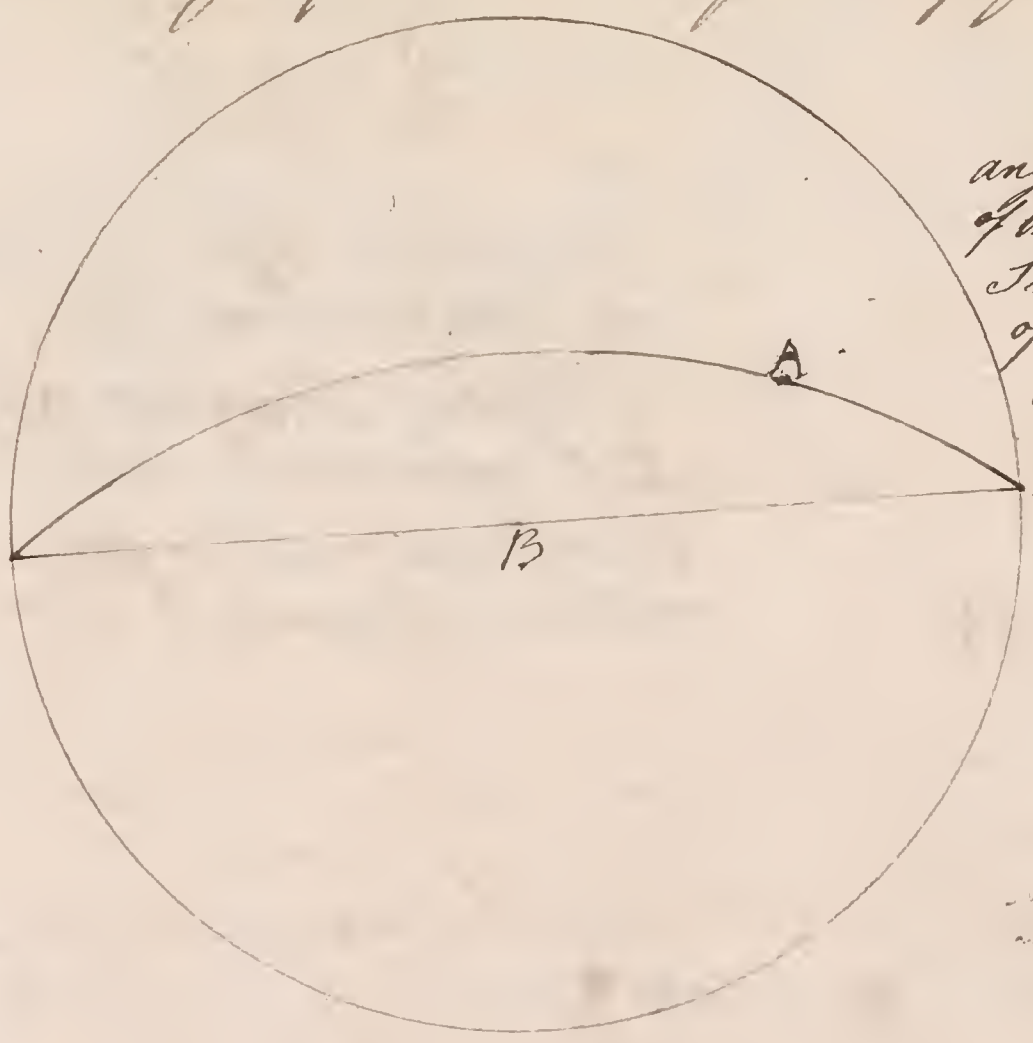
Draw a line to Bisect the Distance Between A & B on this find a Center C from Whence a Circle being Drawn will be the great Circle Required.

Another way



Through the remoter point A Draw a Diameter AC and take the Distance from A to D of the half Tangents which Subtract from 180 and set the remainder from D to C then through the three Points A B & C Describe a Circle and it will be the great Circle required.

Prob. 7. To draw a great Circle thro any given Point A which shall make at the Primitive Circle any given Angle suppose 56°:15 ——

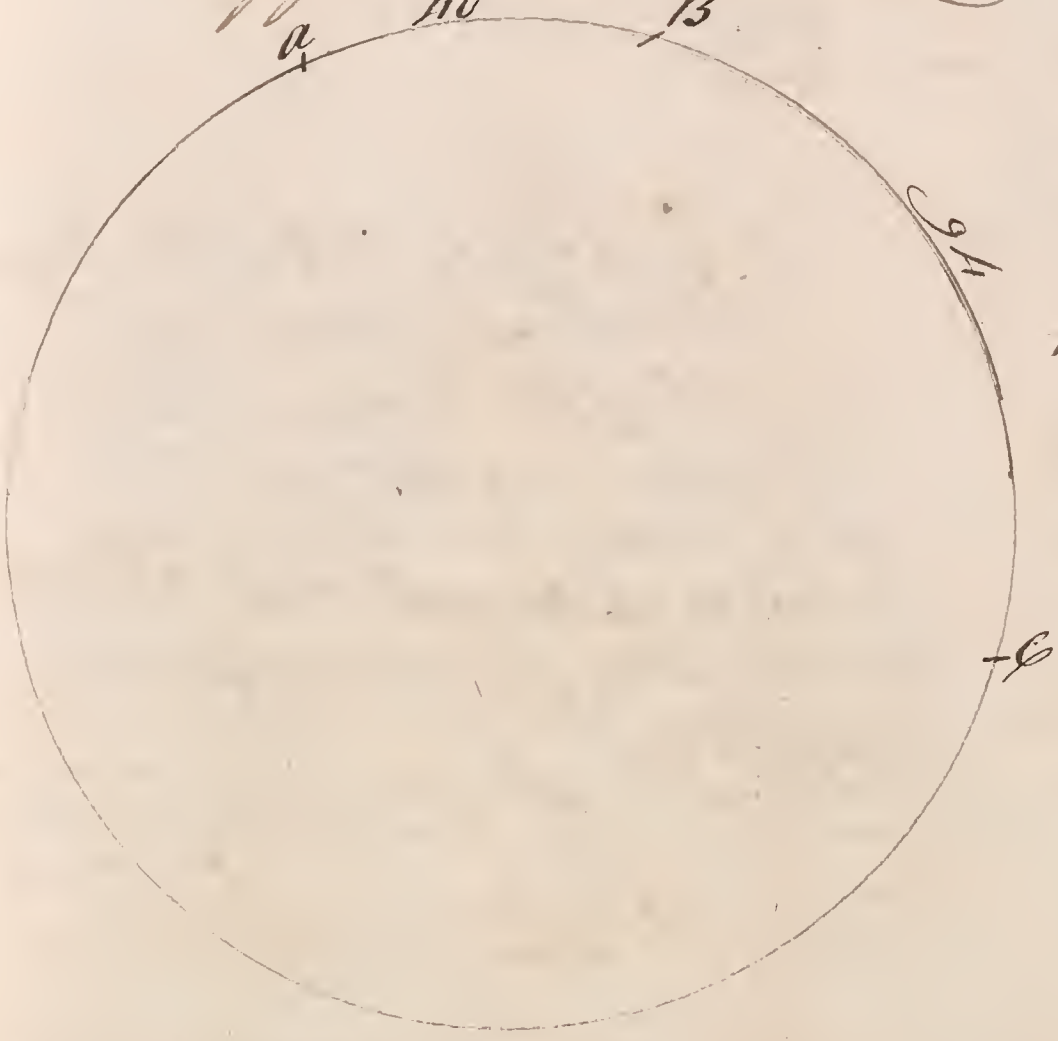


With the Tangent of the given angle and one foot in the Center of the Primitive Circle make a Sweep then with the Secant of the said angle and one foot in the given Point A make another Sweep to Cross the former Sweep at C from thence as a Center Draw a Circle thro A and it will make at D an angle Required.

Prob. 8. To measure any part of a great Circle

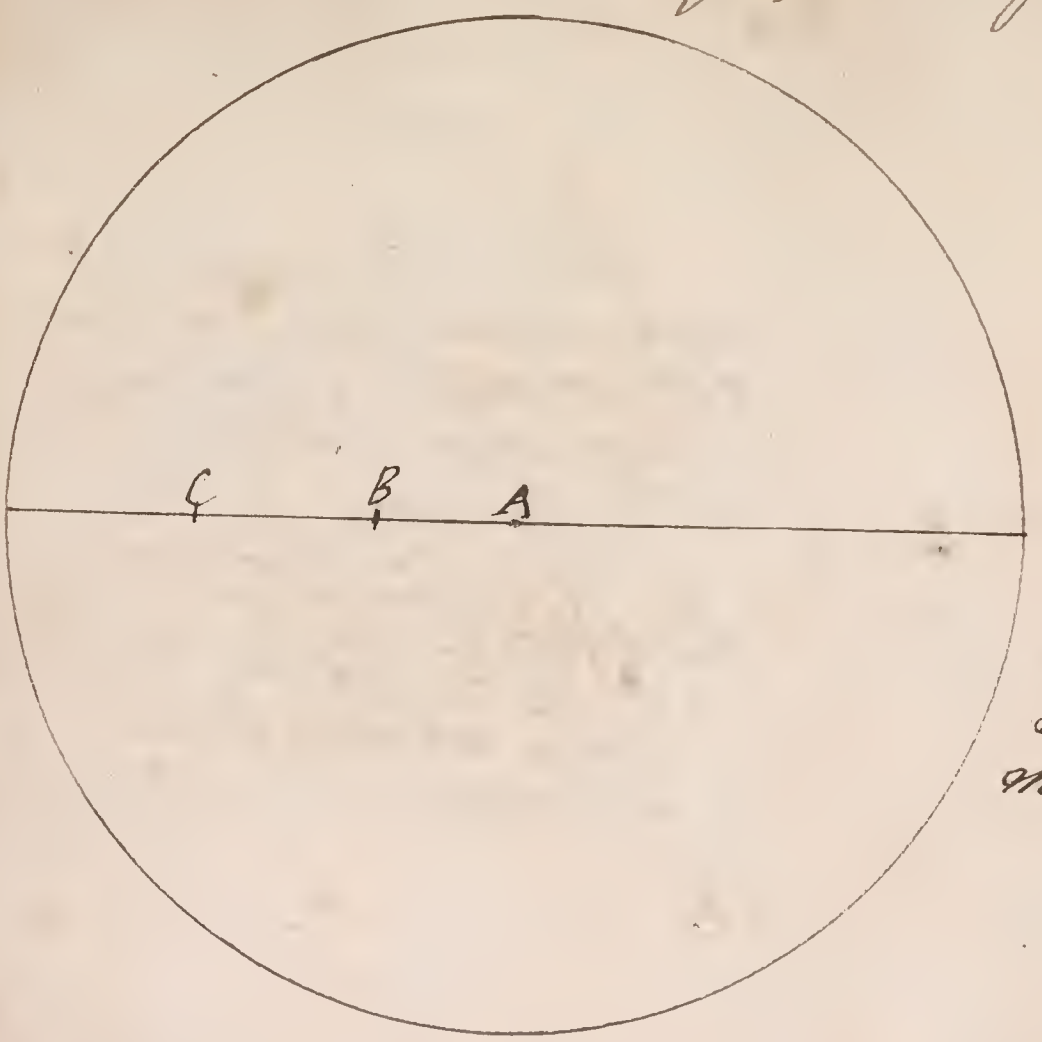
Case 1. To measure any part of the Primitive Circle

Suppose A B and B C



all parts of the Primitive Circle are measured on the Line of Chords therefore A B and B C measured on that Line will give the measure required.

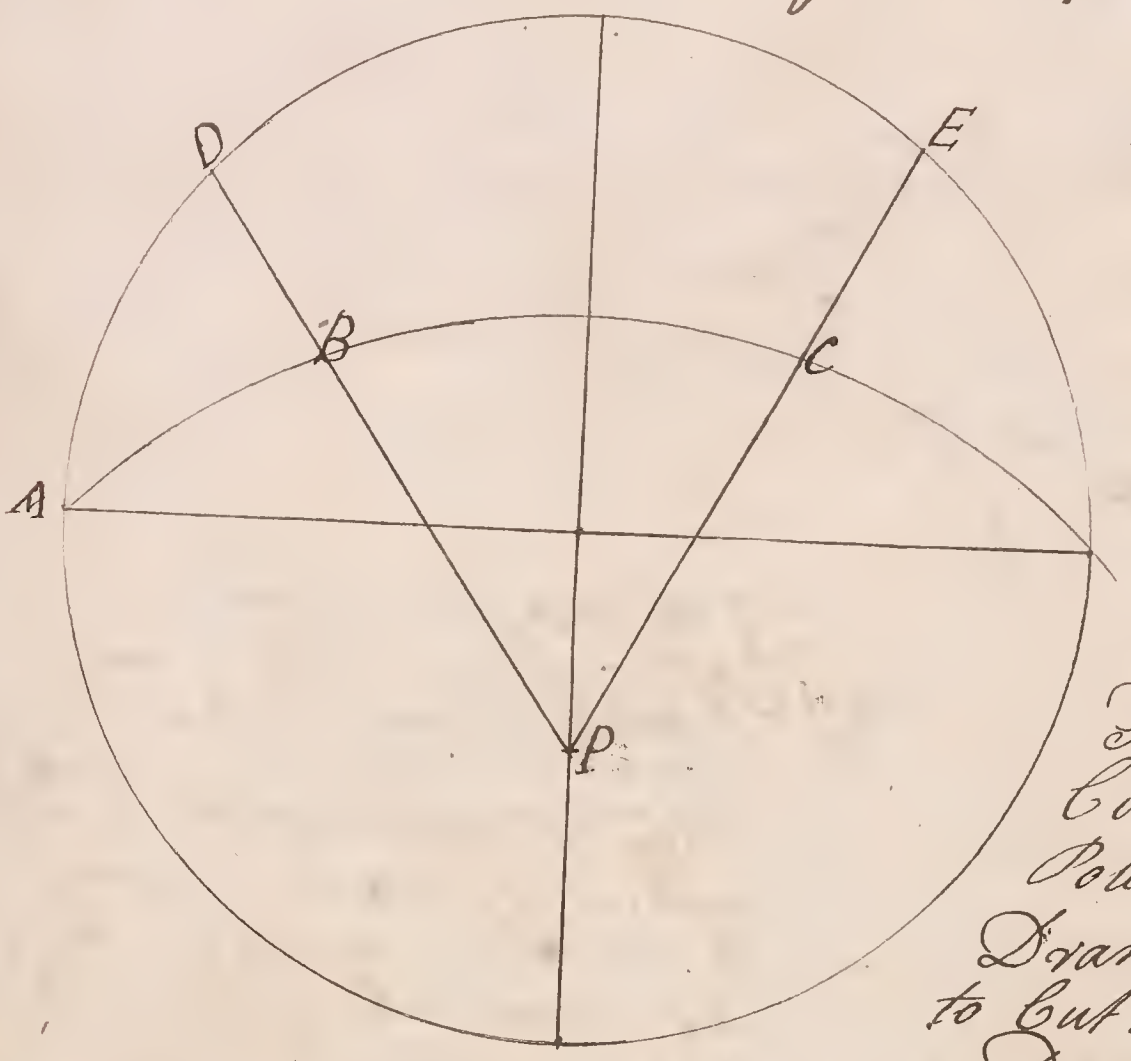
Case 2. To measure any part of a right Circle as AB & BC



A B = 30.00
A C = 62.00
B C = 32.00

all parts of a Right Circle are measured on the ½ Tangents Therefore A B & B C measured on the ½ Tangents will be the measure Required.

Case 3. To measure any part of an oblique Circle as AB & BC



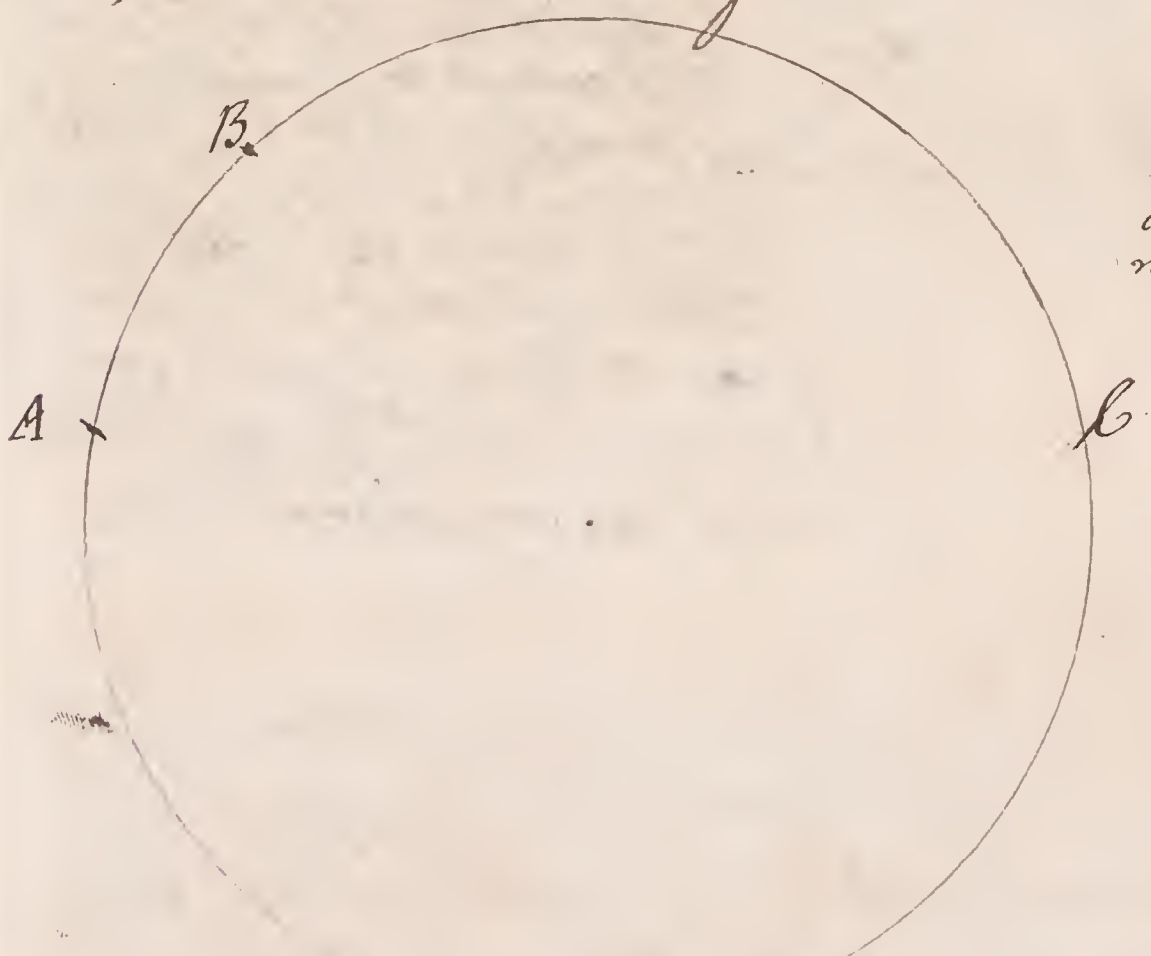
AD = 40.00
DE 90.00

Find the Poles of the Oblique Circle and from P the Poles of the Oblique Circle Draw Lines through B & C to Cut the Primitive Circle in D & E so will AD & DE on the Chords be the measure Required.

Prob. 9. To lay any Number of Degrees on a great Circle

Case 1. To lay any Number of Degrees on the Primitive Circle

Lay 36°:20 on the Primitive Circle from A to B and 123°:25 from B to C

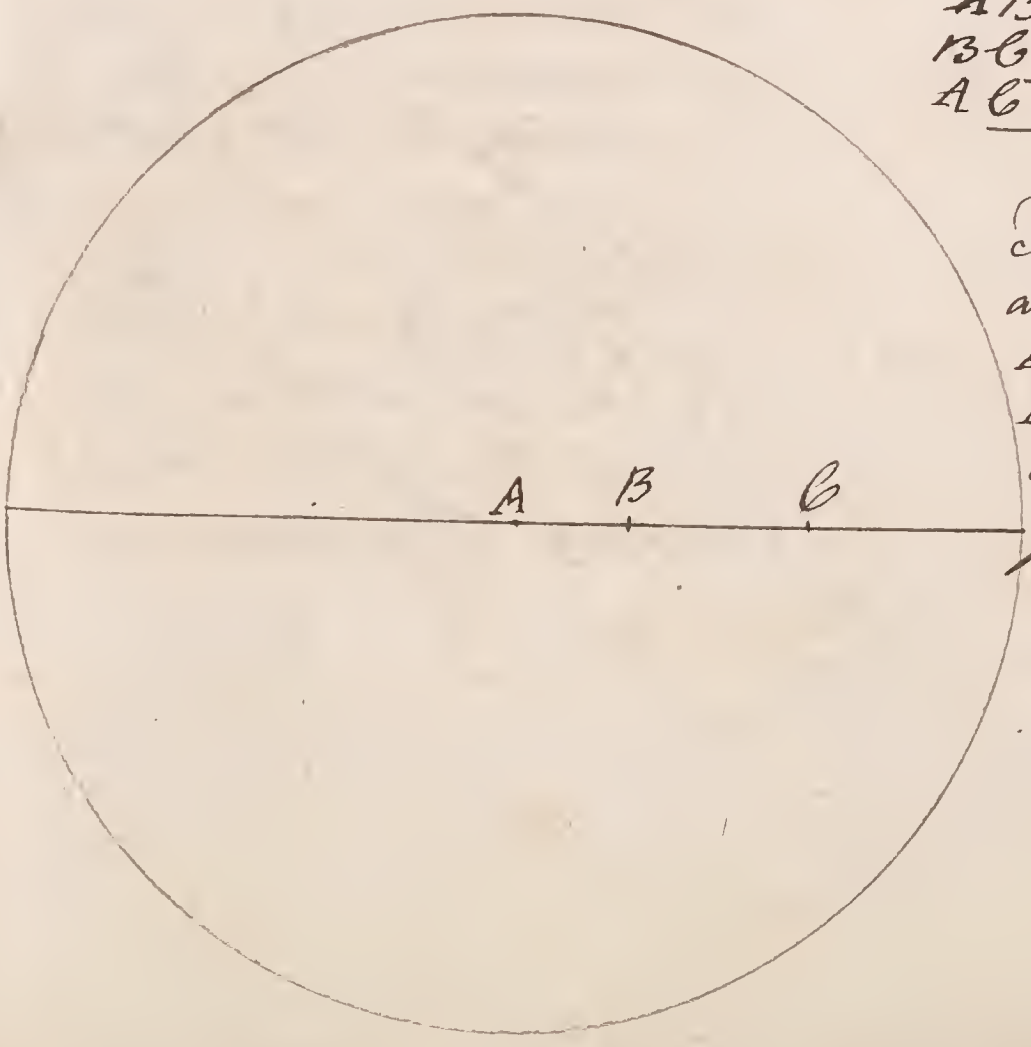


To the Chords Lay 36.20 from A to B and 123.26 from B to C on the Primitive Circle and will be what is Required

Case 2. To lay any Number of Degrees on a right Circle

Lay 22°:30 from a to B & 33°:45 from B to C

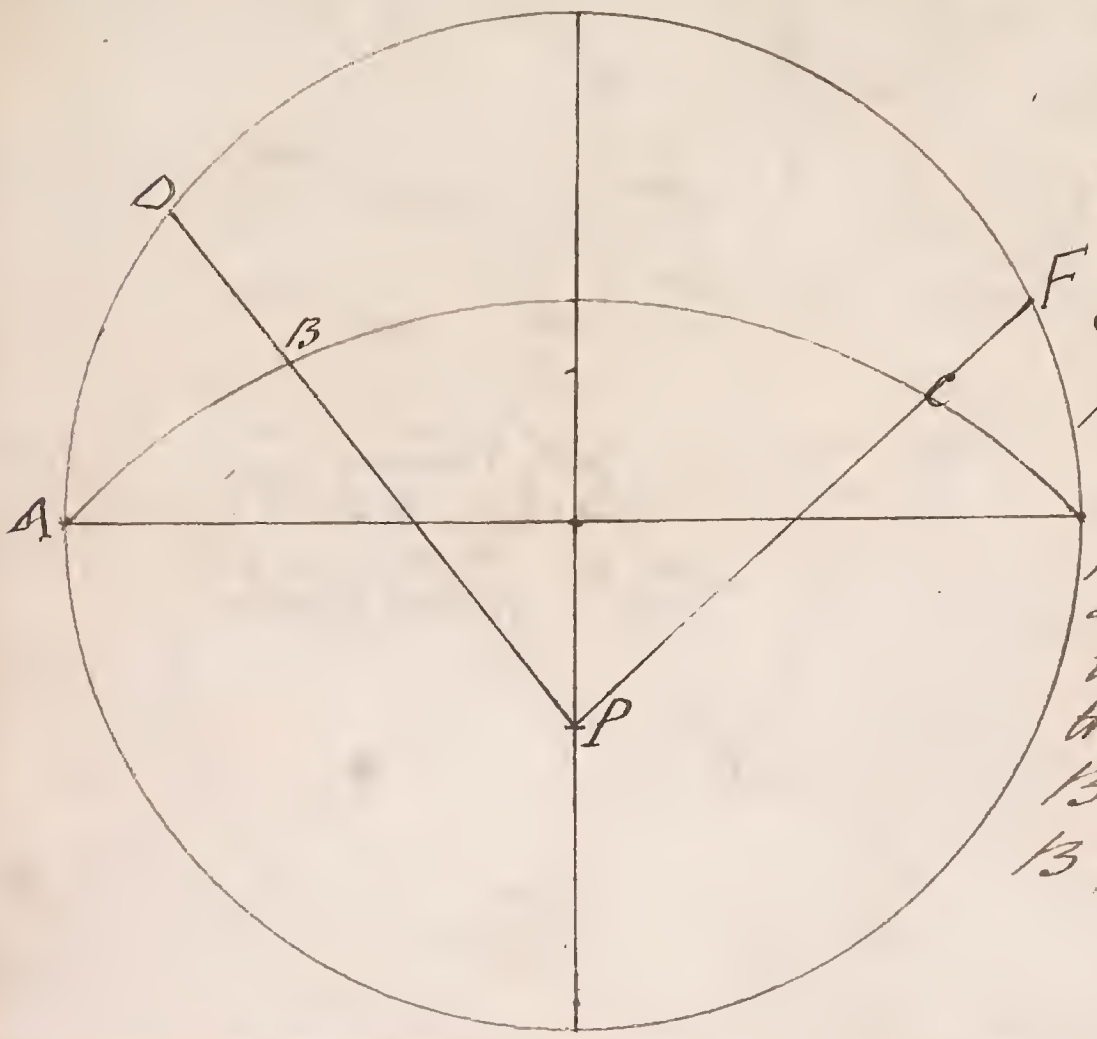
AB 22.30
BC 33.45
AC 56.15



Take 22.30 from o the ∠ Tangents and set off from A to B then a.c.o AB and BC together will give AC which take of the ∠ Tangents and set from A to C and will give BC as required.

Case 3. To lay any Number of Degrees on an oblique Circle

Lay 37°:20' from A to B & 116°:25' from B to C

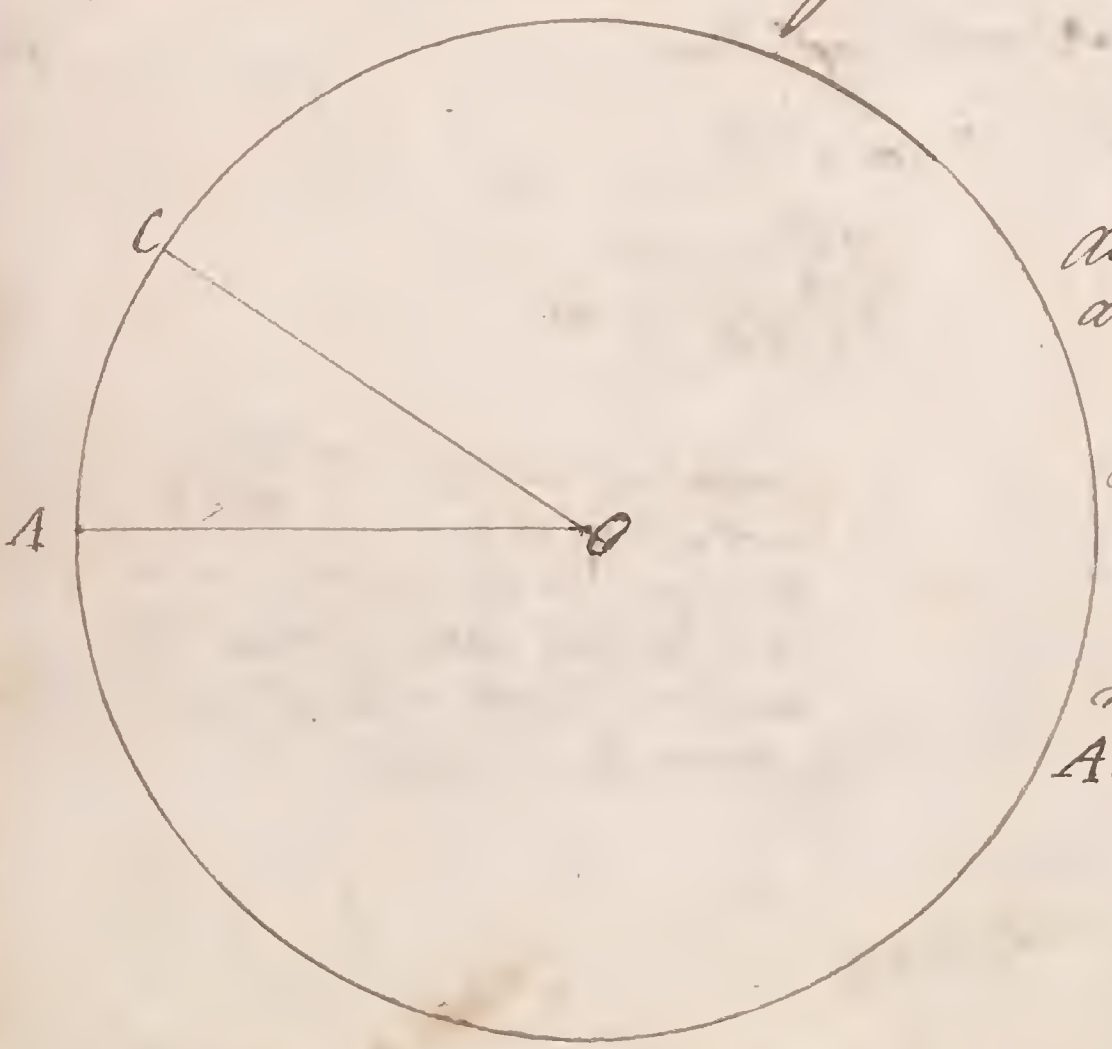


Find P the Pole of the Oblique Circle then take 37°:20' from off the Line of Chords and set it from A to D on the Primitive Circle and 116.25 from D to F then Draw Lines from the Pole to the points D & F to Cut the Oblique Circle in B & C which will give A B & B C as required.

Art. 6. To measure any Spheric Angles

Case 1. To measure a Spheric Angle when the angular Punct is at the Center of the Prim: Circle

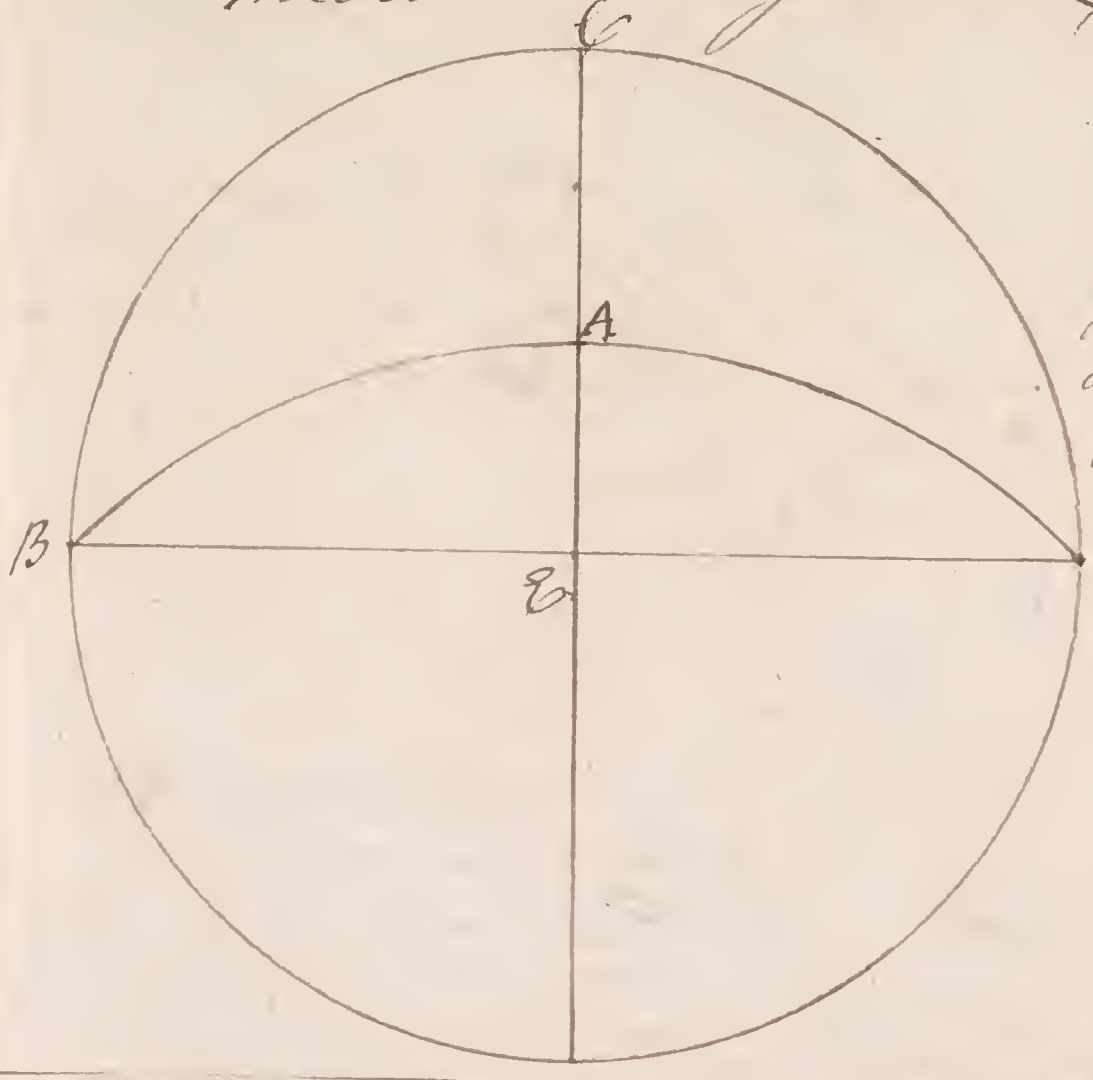
Measure the angle AOC



all angles at the Center are measured on the Circumference of the Primitive Circle therefore A C on the Chords will be the measure of the angle AOC as required.

Case 2. To measure a Spheric angle when the angular Punct is at the Circumference of the Prim: Circle

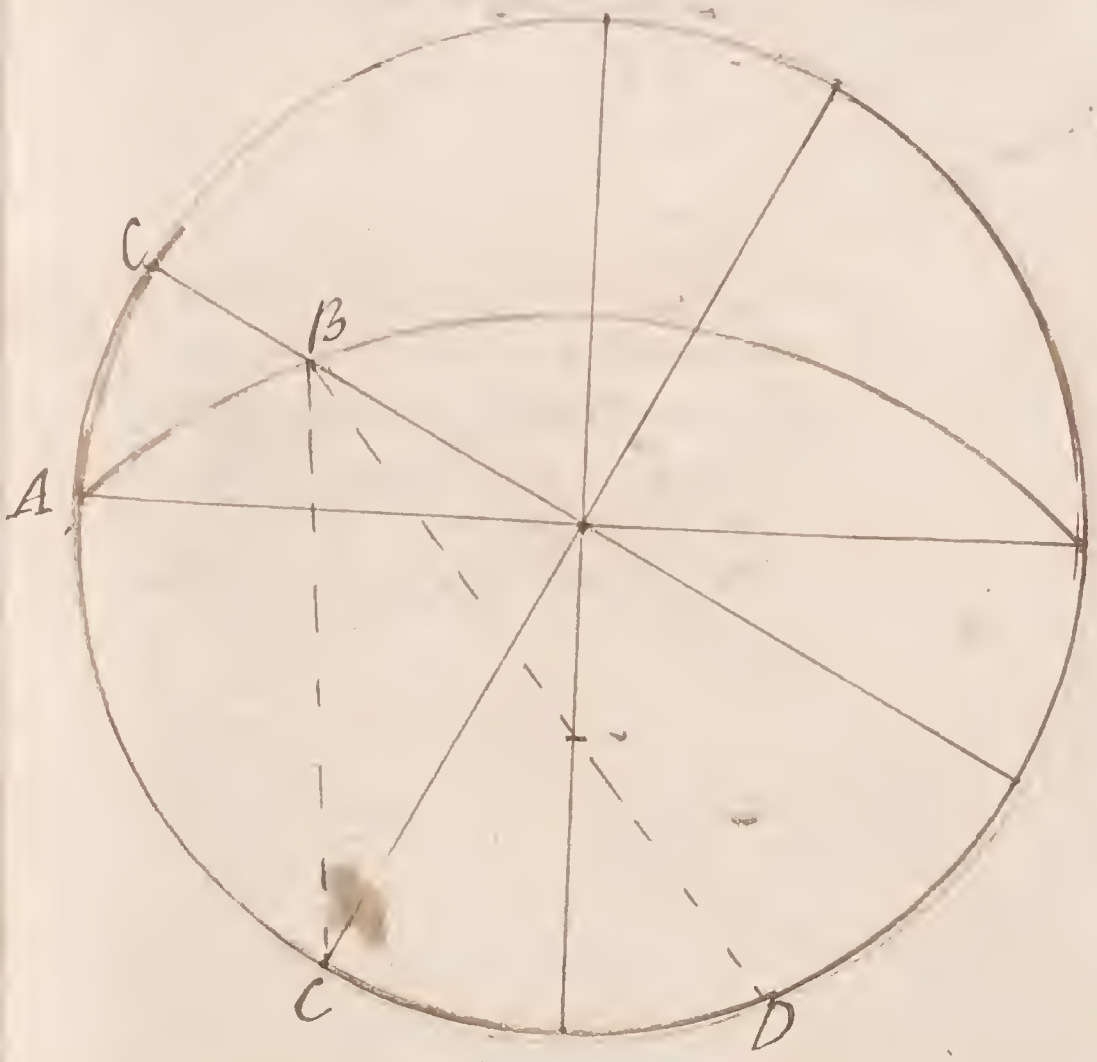
Measure the angle ABC



all angles at the Circumference are measured on a right Circle 90° Distance therefrom therefore EA measured on the half Tangt and taking from 90 is the measure of the angle ABC as required.

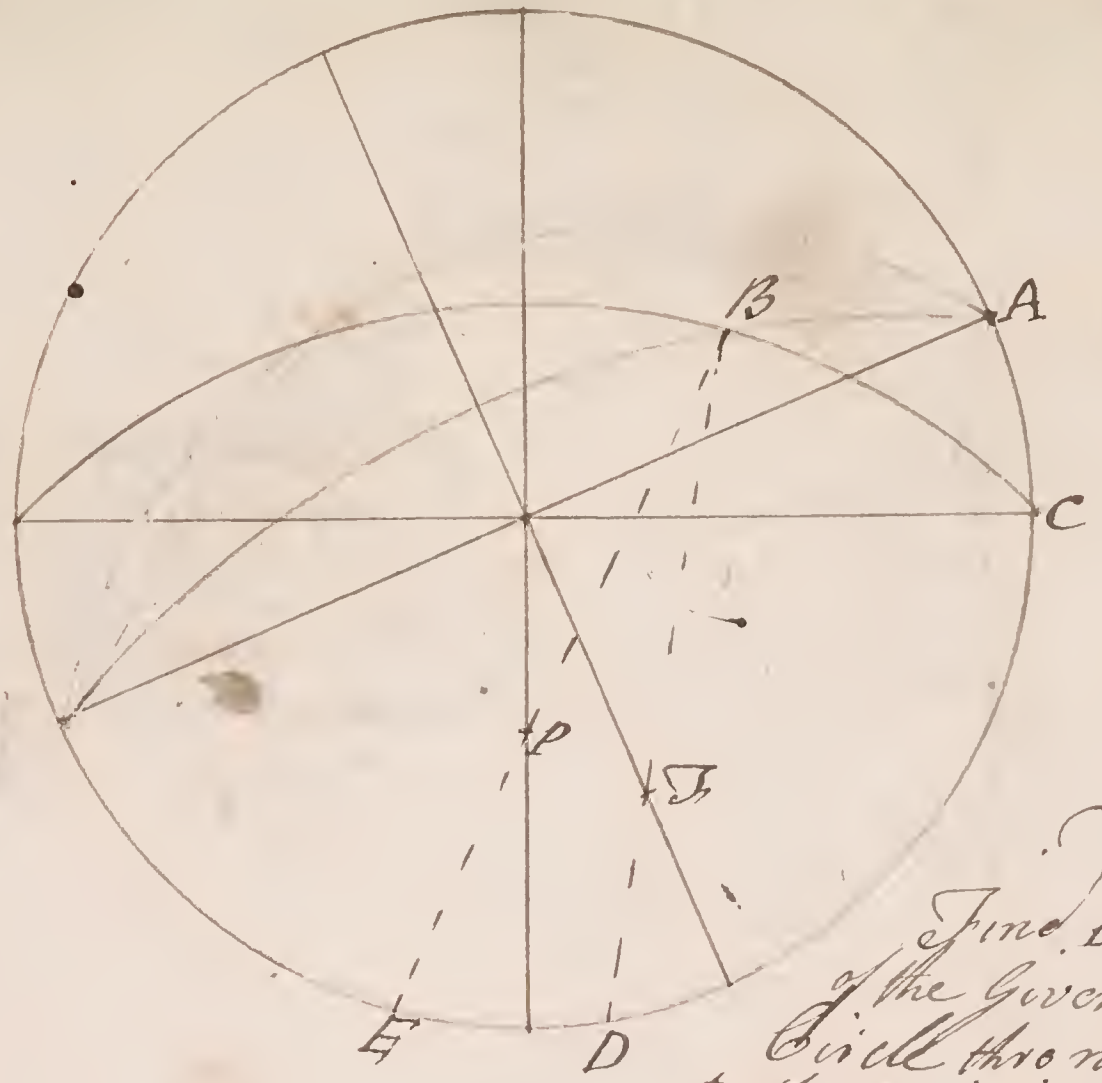
Case 3 To measure a Spheric angle when the Angular Punct is neither of the Center nor Circumference of the Primitive Circle

Variety 1 when one of the Circles is a right Circle. Measure the angle ABC



Find the Poles of both the given Circles through which draw two Lines from the angular Point to the Primitive Circle & will CD on the Chords be the measure of the angle ABC as required.

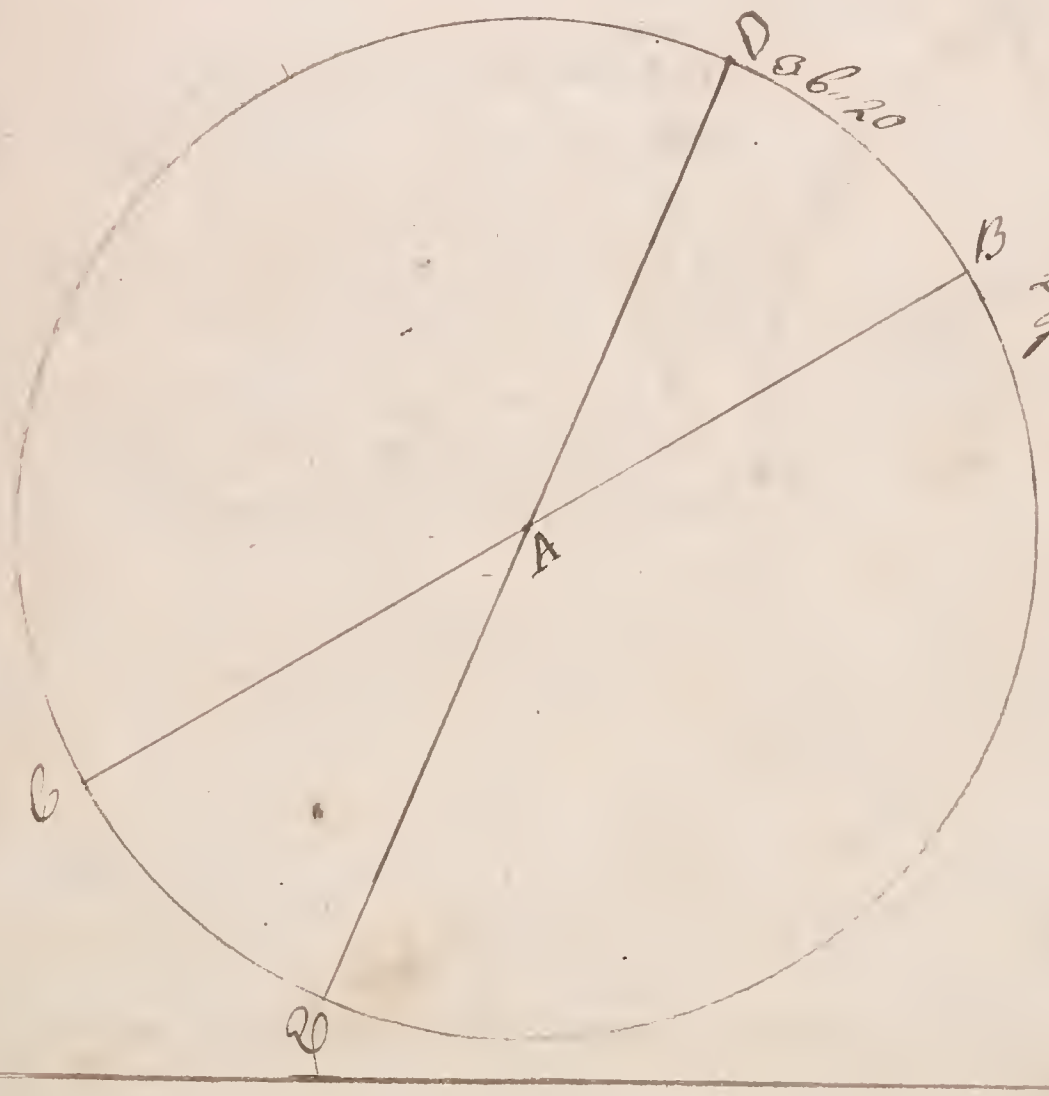
Variety 2d When both the Circles are oblique Circles



Find P & E the Poles of the Given Oblique Circle thro which draw Lines to the Primitive Circle from the angular Point so will DE on the Chords be the measure of the angle ABC as required.

Prob.ᵐ 11 To make a Spheric Angle.

Case 1 To make a Spheric Angle that the Angular Punct may be at the Center of the Primitive Circle. ~ Suppose of 36° 20′



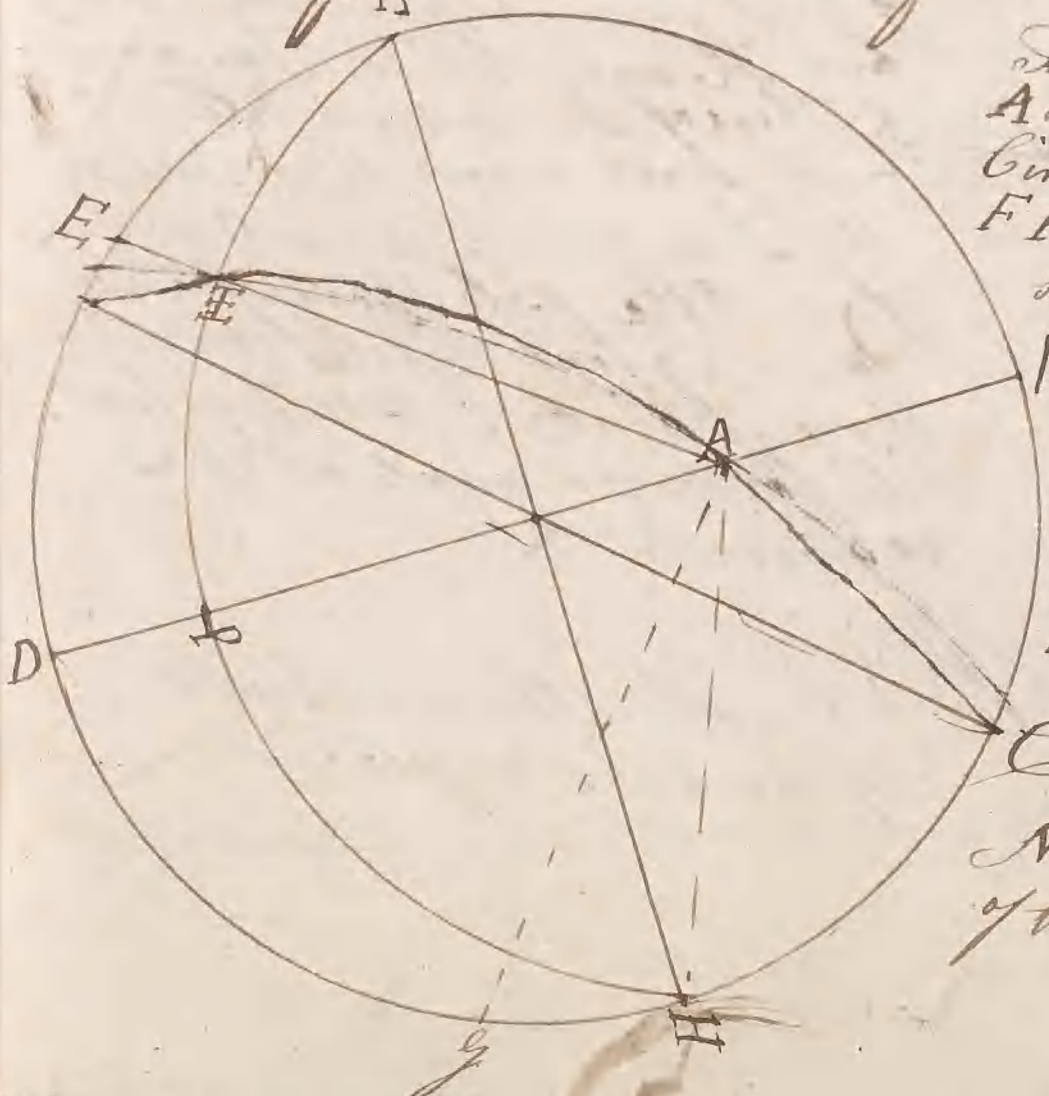
Draw a Diameter BAC and Lay 36° 20′ of the Chords from B to D on the Primitive Circle and Draw DE thro the Center and it will form the angle BAD as required

Case 2. To make a Spheric Angle suppose of 56° 15' that the angular Point may be at the Circumference of the Primitive Circle

Take the Secant of the given angle and one foot in A Describe an arch and set one foot in E and Describe a nother arch to Cut the former in B from which Point draw a great Circle ABE and it will form the angle BAC as Required.

Case 3. To make a spheric angle suppos of 18° 40' so that the angular Point may neither be at y^e Center or Circumference of the Primitive Circle but at some intermediate point

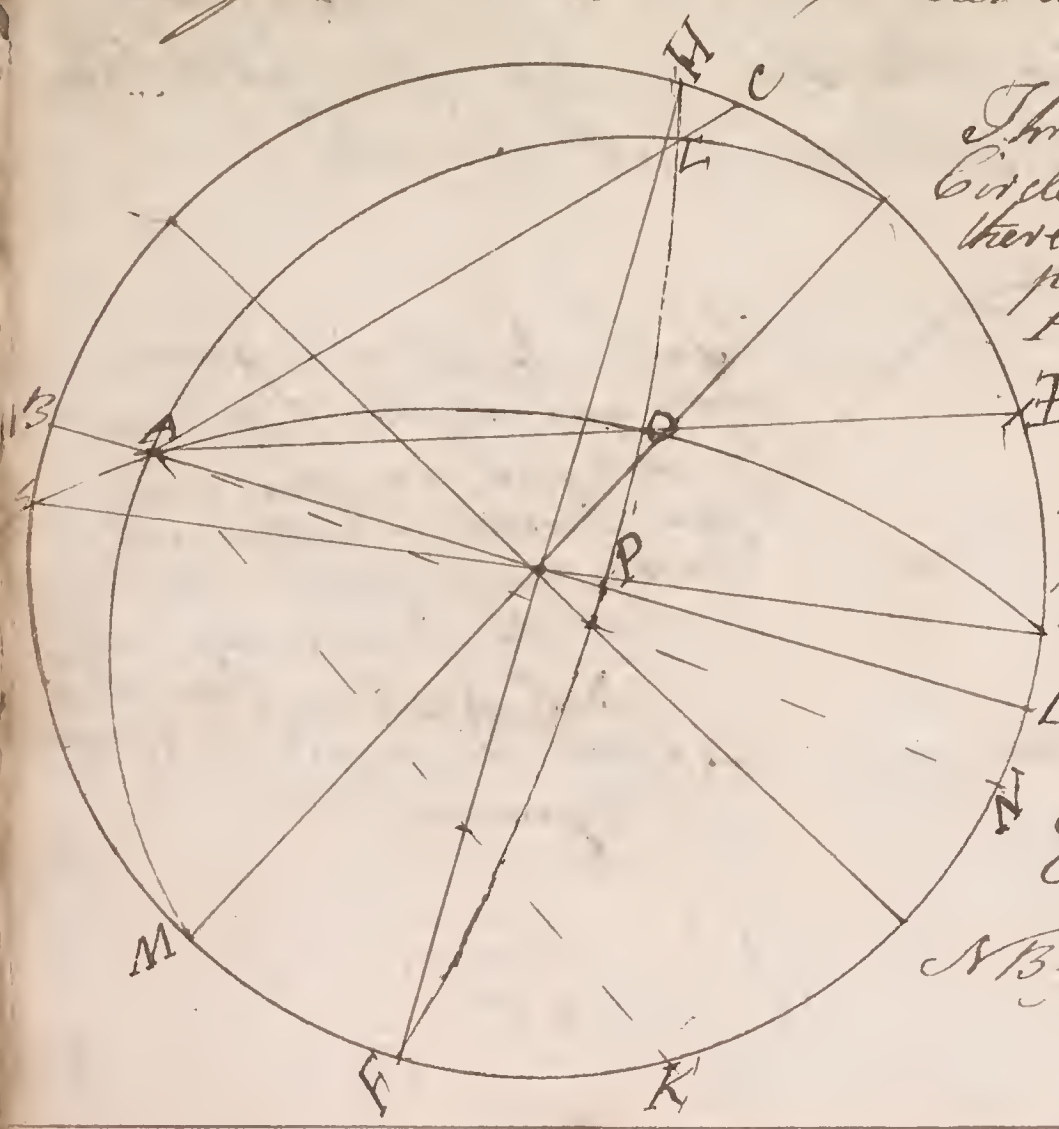
Variety 1. When one of the Circles is a right Circle



Find P the Pole of the given Point A and F M the Pole of the given right Circle then thro the three Points F P H draw a great Circle on which set off your given angle from P to E B by getting 4 of the No from D to E and Draw in the right Line E H A then a great Circle drawn thro the two points A and H will form the angle B A C as required.

N B. G H C is the measure of the said angle

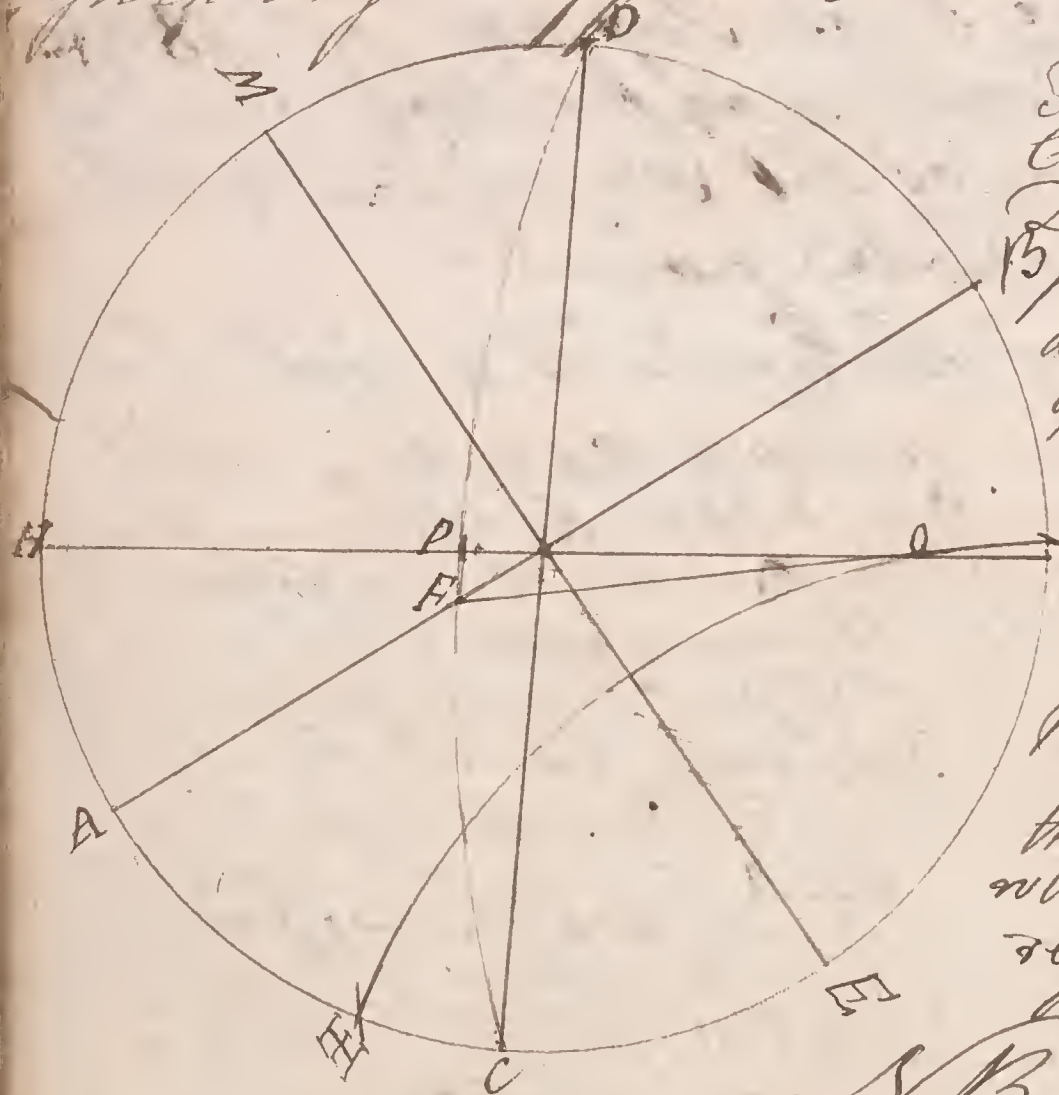
Variety 2 when both the Circles are Obligue Circles



Thro the given point A draw a right Circle B P and E M at right Angles thereto then find P the pole of the point a. Then thro the three points F P & M draw a great Circle mark E where that Circle Cuts the Obligue Circle L thro which draw a Line to Cut the Primitive in C from which Set of the given Angle to O to E from whence draw the Line A O E mark where that D Cuts the great Circle in O thro which and the point draw a great Circle and that will form the Angle C A M as required.

N B N K is the measure of the said angle.

Prob. 12. From a given Punct in the Primitive Circle to draw an obligue Circle that shall make any given angle Suppose 56 : 15 with a given right Circle a B



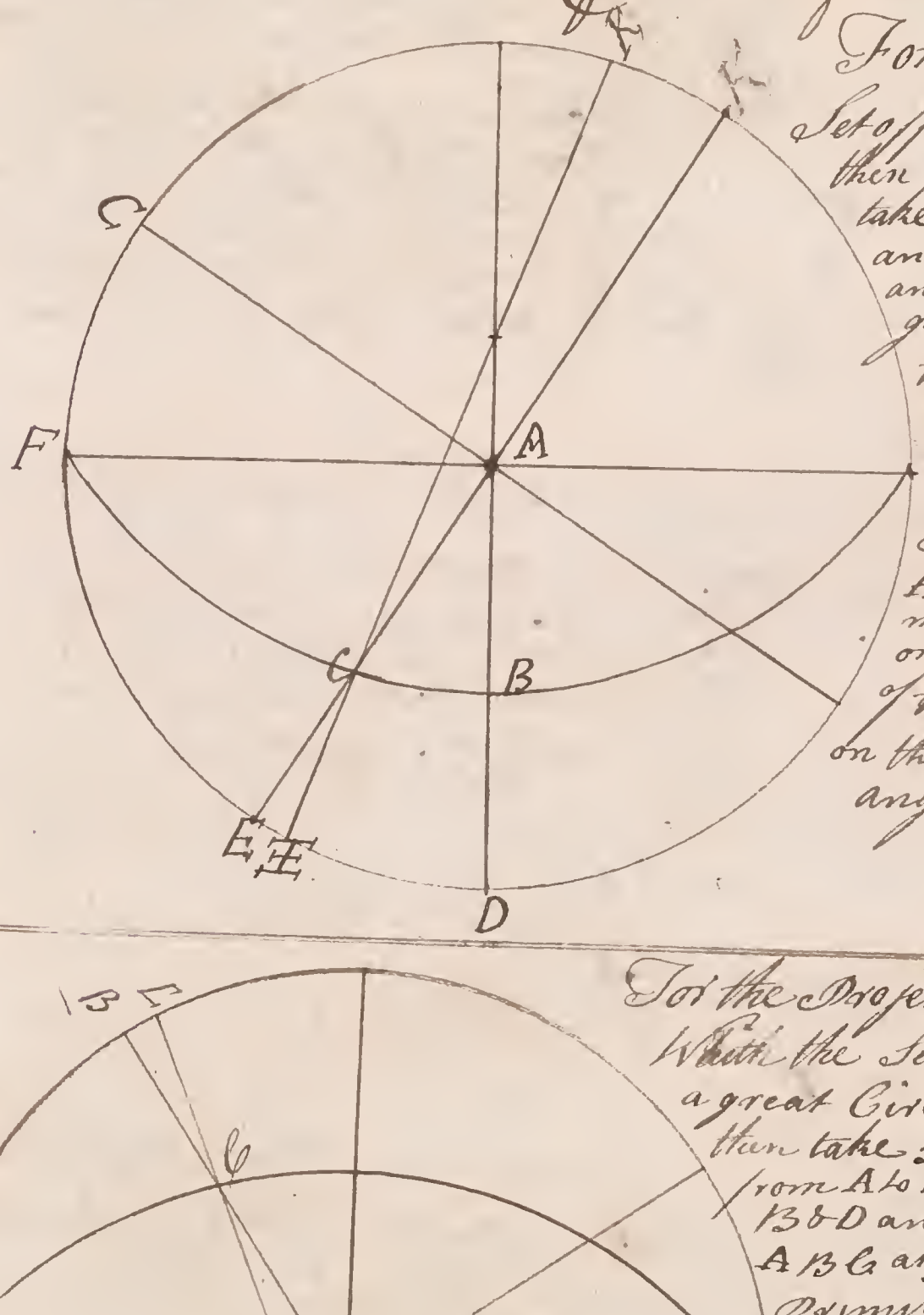
Find the Poles of the Given Circle A B then Draw the Diameter C D from the given point C and another at right angles thereto then set the Chord of your given angle from C to J and K and with the Tangent K Thereof Sweep the Circle J O K mark where that Cuts the Diameter H C L in O and find O the pole thereof and draw a great Circle thro the three points C D & D which will form an angle at J as required.

N B C K is the measure of the said angle.

Right angled Spherical Trigonometry performed Geometrically

Case 1 Given { Base AB = 56°15′ / Angle at A = 33°45′ }

With them it is req.d to make two right angled Spherical Triangles one at the Center & the other at the Circumference of the Primitive Circle

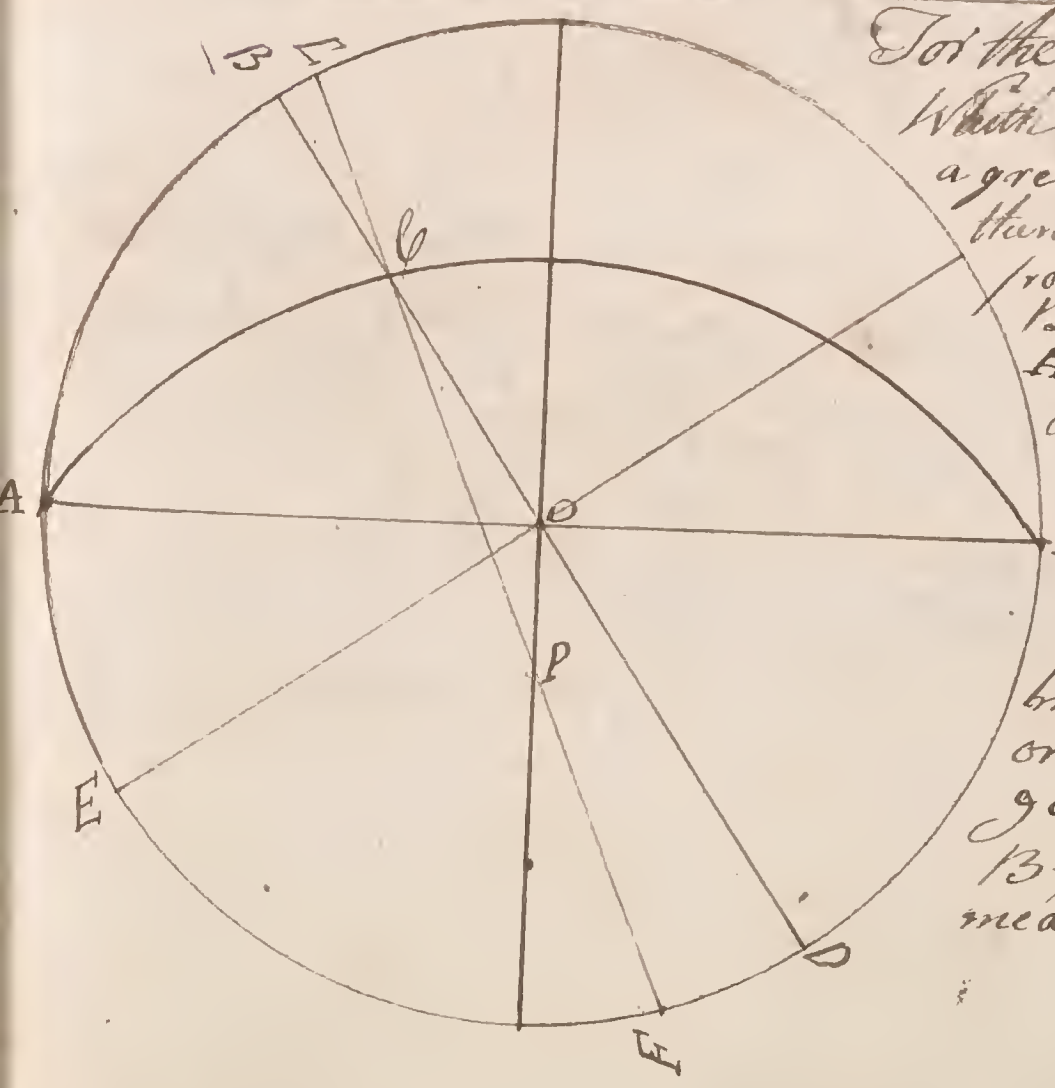


For the Projection at the Center

Set off the given angle from D to E then draw a right Circle AC E then take 56° 15′ from the ∠ Tangents and set it from A to B through which and the two points E & H draw a great Circle and it will form the Triangle A B C at the Center of the Primitive as required

To measure the things required

AC on the ∠ Tangents is the measure of the Hypo.t E D on the Chords is the measure of the perpendicular B C. E C on the Chords is the measure of the angle as required.



For the Projection at the Circumference

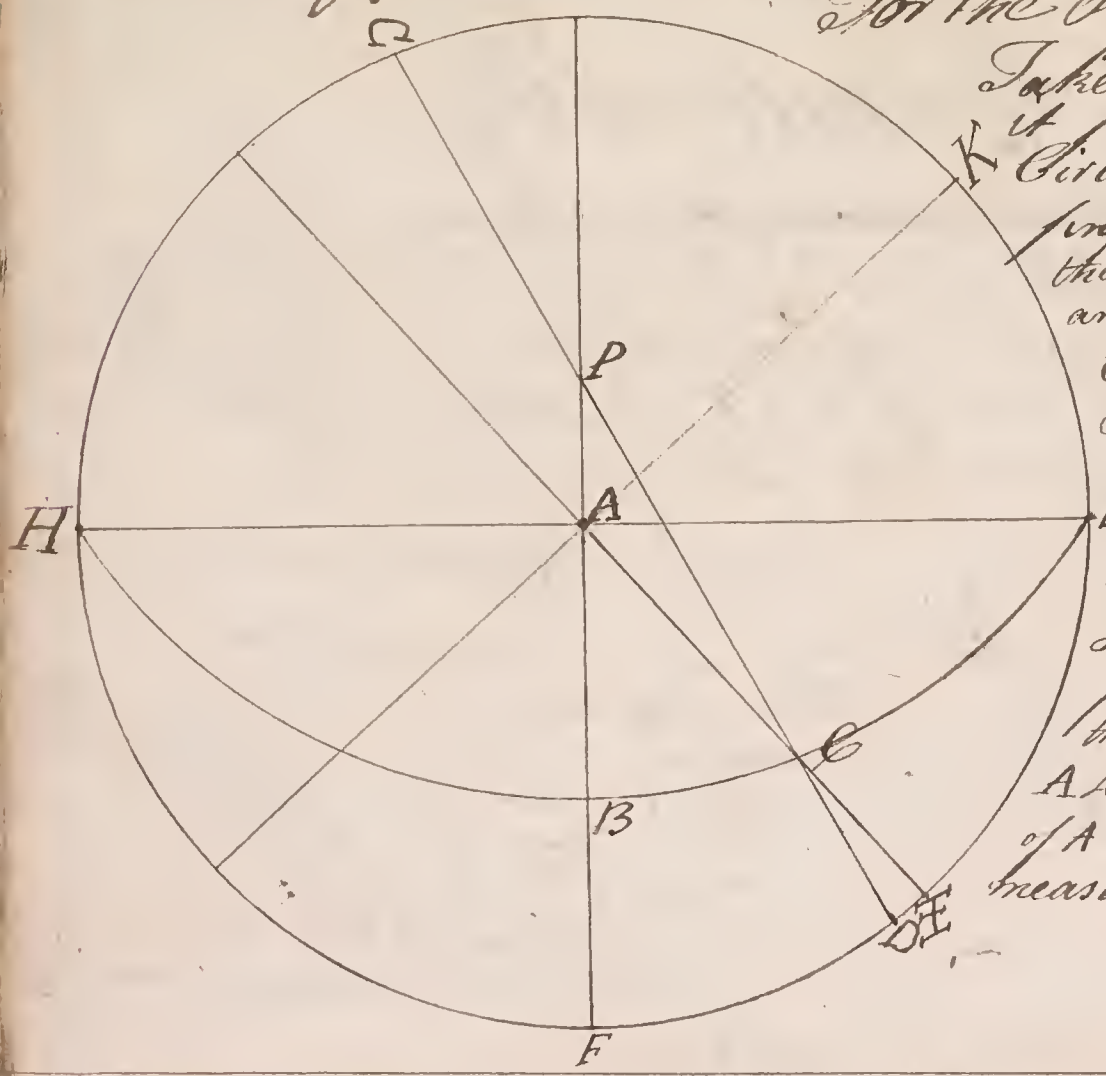
With the Secant of the given angle sweep a great Circle thro the two points A & H. then take 56° 15′ off the Chords and set it from A to B then draw a great Circle B & D and it will form the Triangle A B G at the Circumference of the Primitive as required.

To measure the things required

from A to L on the Chords is the measure of the Hypoot A G from O to G on the ∠ Tangents and taken from 90 is the measure of the perpendicular B C F to E on the Chords is the measure of the angle C as required

Case 2 Given { Base AB = 57° 20′ ; Apr BC = 36° 50′ } To make as before

For the Projection at the Center

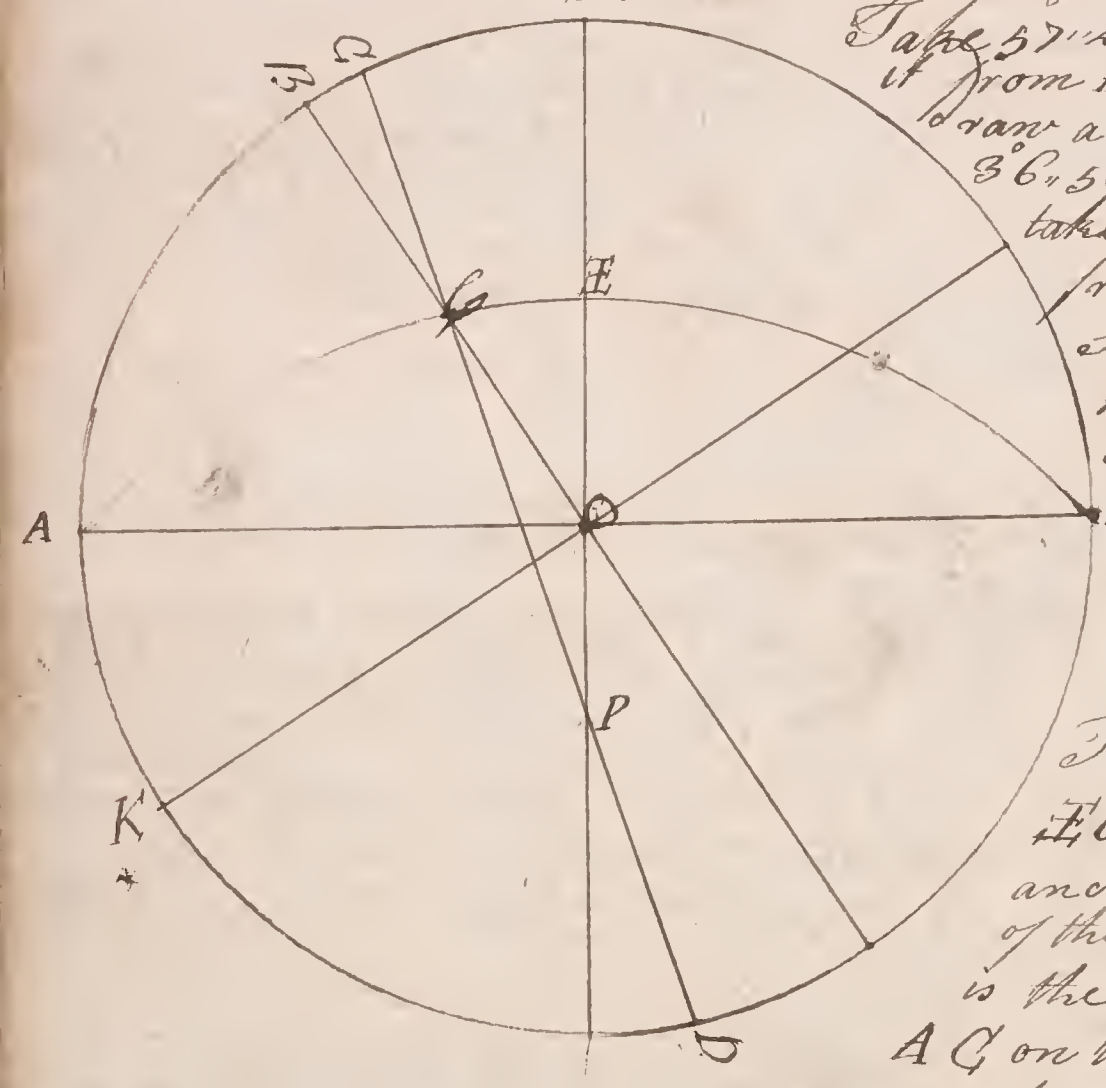


Take 57° 20′ off the ∠ Tangents and set it from A to B then sweep a great Circle thro the three points H I B & E find P the Pole of the given Circle then take 36° 50′ from off the Chords and set it from F D on the Primitive Circle then draw a Line from the Pole to D to Cut the great Circle in C thro which and the Center draw a great Circle and it will form the Triangle A B C as required

To measure the things Required

From F to E on the Chords is the measure of the angle A from A to C on the ∠ Tangents is the measure of A C from K to C on the Chords is the measure of the angle C.

For the Projection at the Circumference



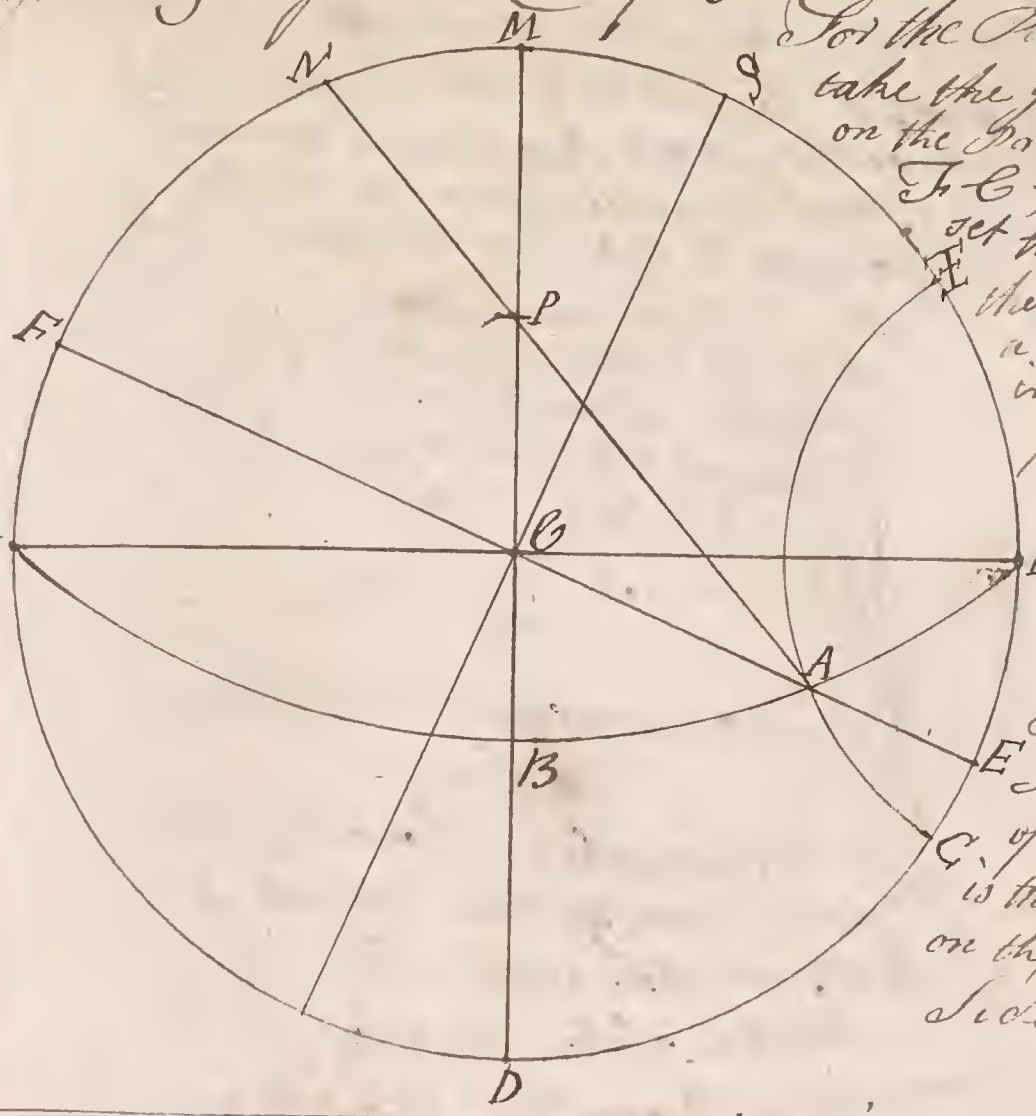
Take 57° 20′ from off the Chords and set it from A to B on the Primitive then draw a right Circle B O C then 36° 50′ Substracted from 90 and taken off the ∠ Tangents and set from O to C then a great Circle Sweeped thro the three Points A C & E will form the Triangle A B C as required

To measure the things Required

E O measured on the ∠ Tangents and taken from 90 is the measure of the angle A. D K on the Chords is the measure of the angle C — A C on the Chords is the measure of the Side A C

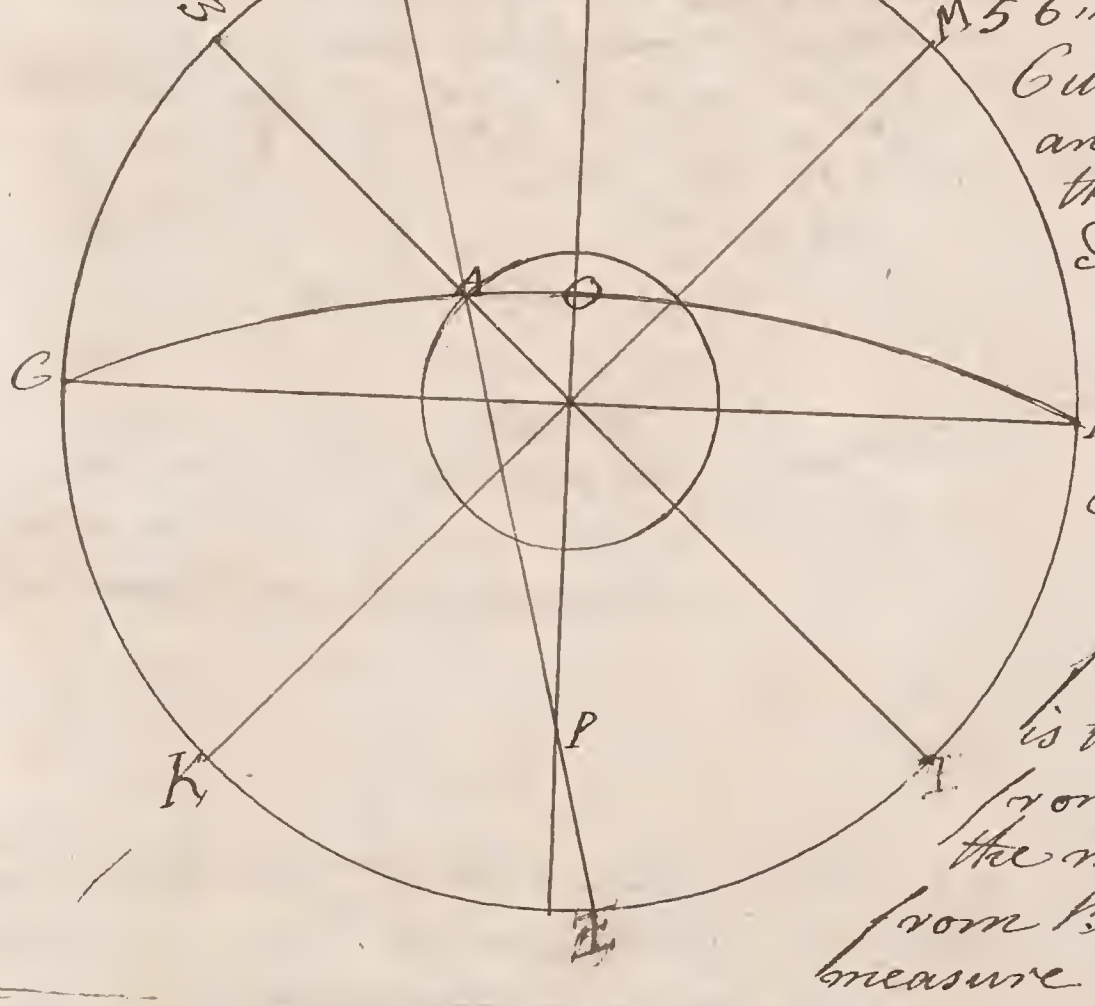
Case 3 { Base AB = 56° 15′ } To make as before
Given { Angle at C = 67° 30′ }

For the Projection at the Center
take the given angle and set it from D to E
on the Primitive then draw a right Circle
F C E then take 56° 15′ from 90 and
set the remainder from K to I and C
then with the Tangent thereof sweep
a Circle to cut the right Circle
in A thro which and the two
points H & K sweep an Oblique
Circle and it will form the
Triangle A B C as required.



To measure the things Requir'd
N S on the Chords is the measure
C. of the angle A B C on the ∠ Tangents
is the measure of the Side B C A C
on the ∠ Tangents is the measure of the
Side A C.

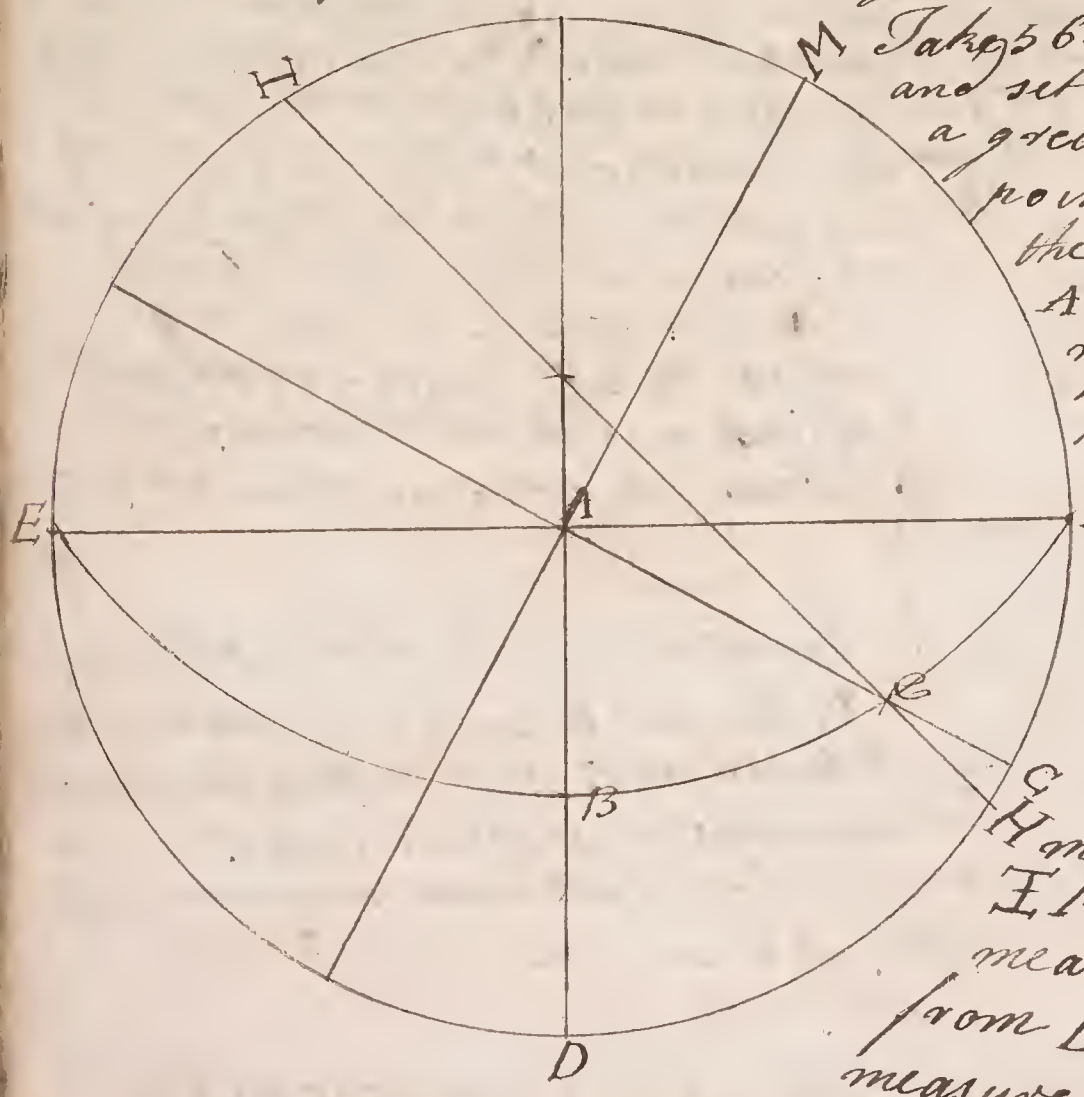
For the Projection at the Circumference
With the Secant of the given angle
sweep a great Circle C O F then
with the Complement thereof
M 56° 15′ sweep a Circle to
Cut the great Circle in A
and Draw a right Circle
thro A and it will form the
Triangle A B C as Required



To measure the things
Requir'd

from C to B on the Chords
is the measure of C B.
from E to K on the Chords is
the measure of the Angle A
from B to C on the Chords is the
measure of A C

Case A
Given { Base AB = 56° 15′
Hypot AC = 72° 00′
} To make an Projection at the Center

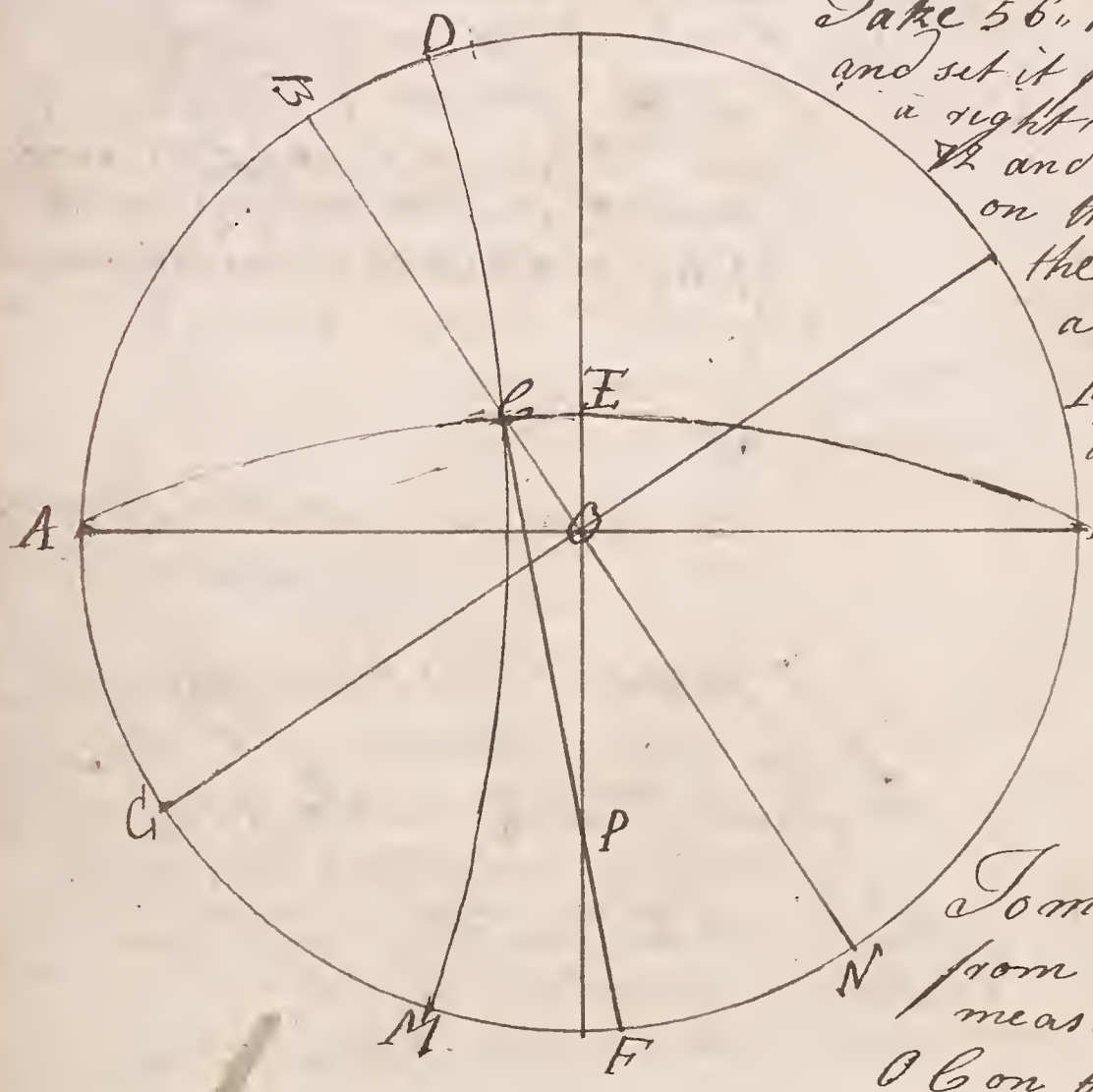


Take 56° 15′ from of the ∠ Tangents and set it from A to B then sweep a great Circle thro the three points E B & F then take 72° off the ∠ Tangents and set it from A to C thro which draw a right Circle and it will form the Triangle A B C as Required.

To measure the things Required.

D C on the Chords is the measure of the angle A —
H I M on the Chords is the measure of the angle C
from D to H on the Chords is the measure of the Side B C

For the Projection at the Circumference

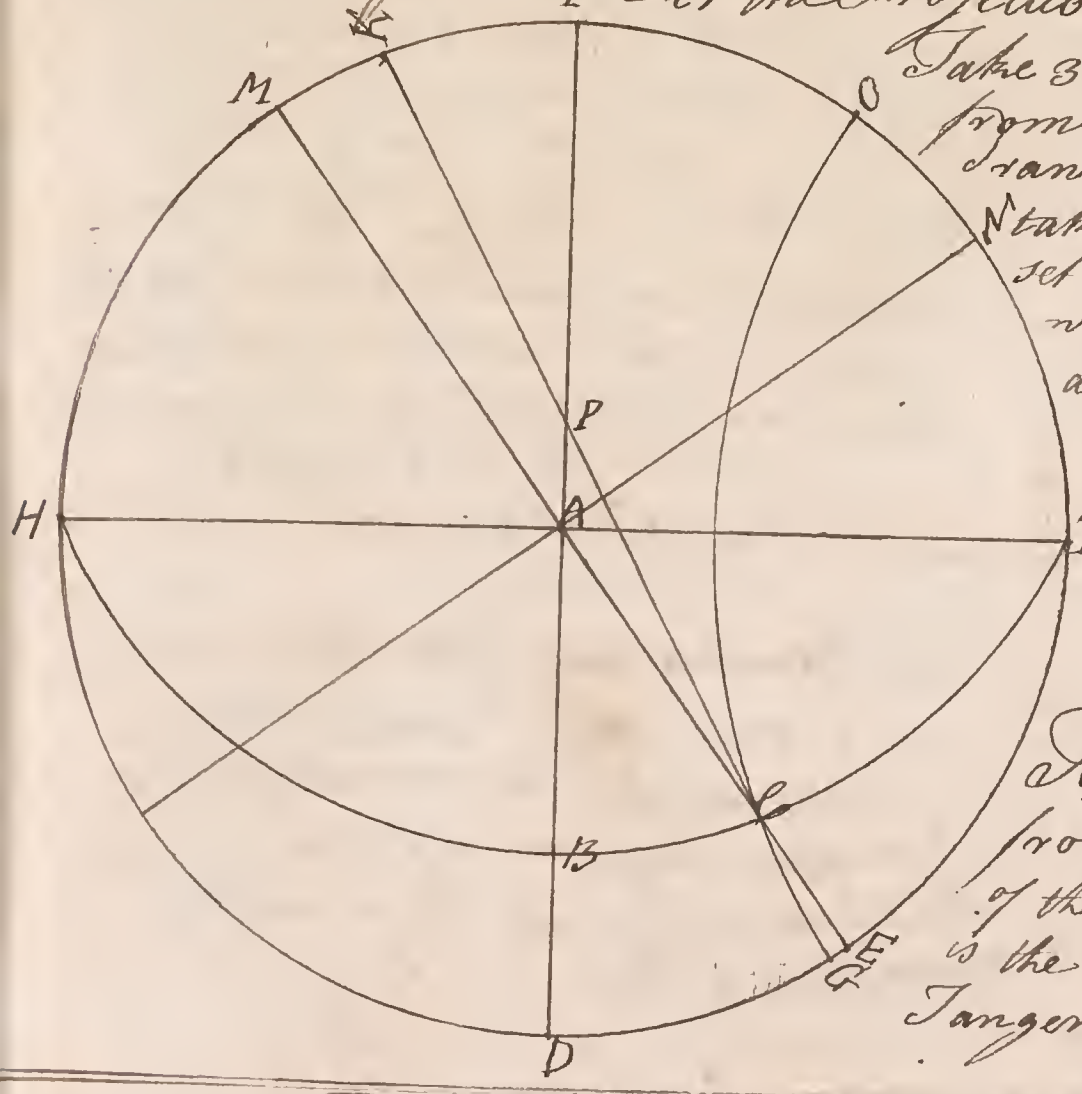


Take 56° 15′ from of the Chords and set it from A to B then draw a right Circle B O N then take 72° and set it from A to D & M on the Primitive then with the Tangent thereof sweep a parallel Circle from D to M to Cut the right Circle in E thro which and the two points Draw a great Circle and it will form the Triangle A B C as required.

To measure the things Required
from F to C on the Chords is the measure of the angle C —
O C on the ∠ Tangents and taken from 90° will give the Side B C —
E O on the ∠ Tangents and taken from 90° is the measure of the angle A —

Case 5 } ∩ pr BC = 33° 45′ } To find the rest
Given } Angle at A = 36° 20′ }

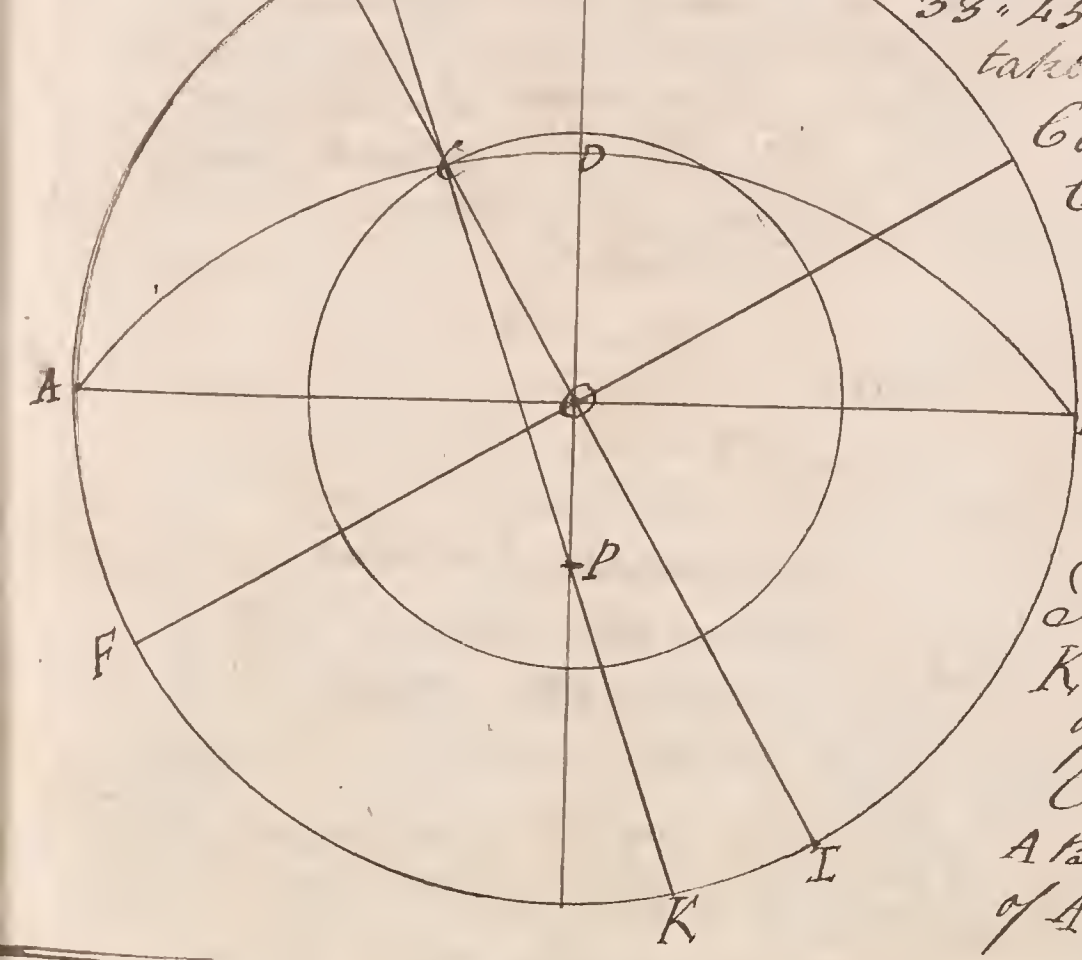
For the Projection at the Center



Take 36° 20′ from off the Chords and set it from D to E on the Primitive then draw a right Circle E A M then take 33° 45′ from off the Chords and set it from F to O & from D to C then with the Tangent Compt thereof sweep a parallel Circle to Cut the right Circle in C thro which and the two points sweep a great Circle and it will form the Triangle A B C as required.

To measure the things required from N to K, on the Chords is the measure of the angle C A B on the ∠ Tangents is the measure of A B / A C on the ∠ Tangents is the measure of A C

For the Projection at the Circumference



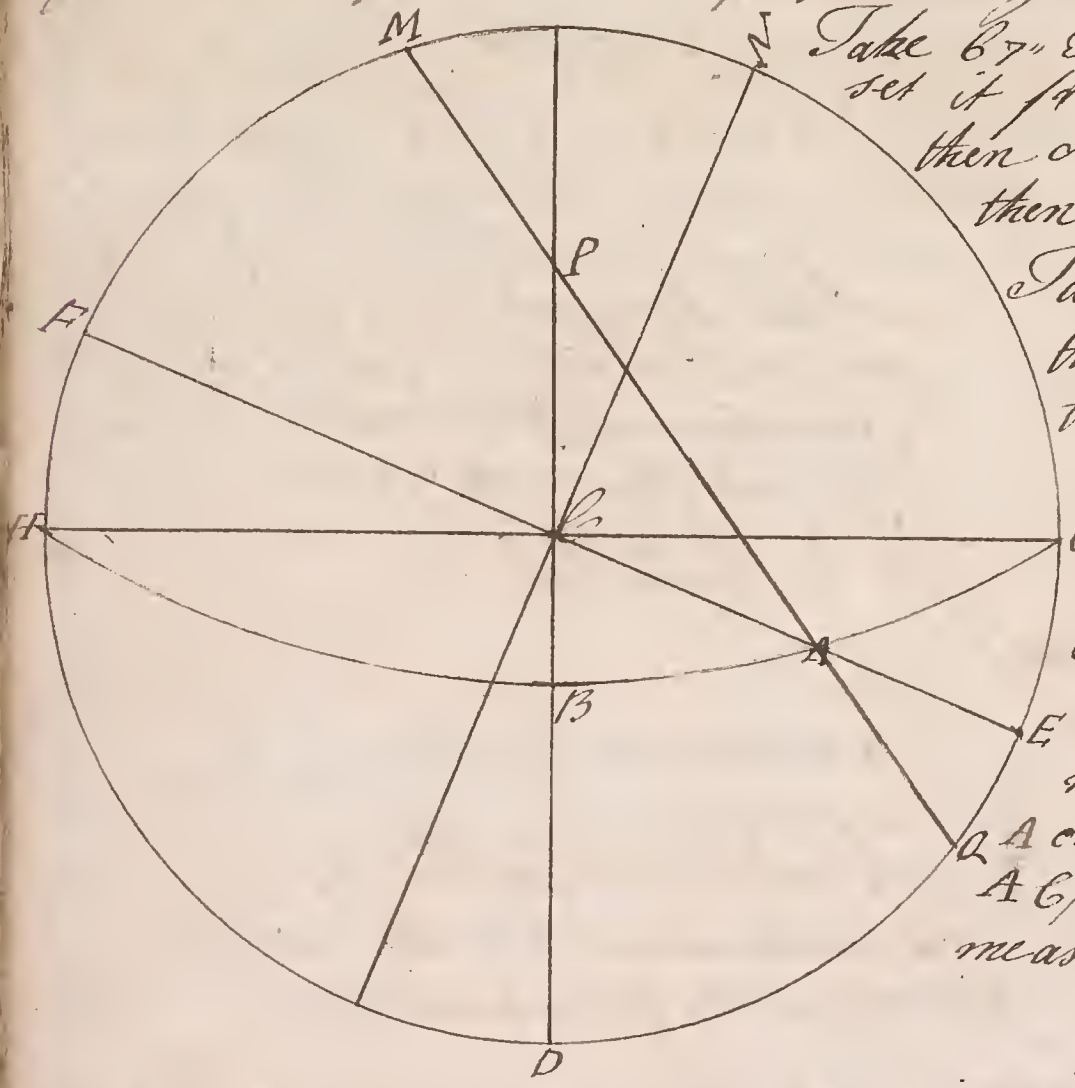
Take the Secant of the given angle sweep a great Circle A D H then Substract 33° 45′ from 90° and with the remainder taken off the ∠ Tangents sweep a Circle to Cut the great Circle in C and draw a right Circle thro C and it will form the Triangle A B C as required.

To measure the things Required K F on the Chords is the measure of the angle C A Q on the Chords is the measure of A C A B on the Chords is the measure of A B

Case 6 $\left.\begin{array}{l} \text{Opp}^{r} BC = 33^{\circ}:45' \\ \text{given Angle at } C = 67:30 \end{array}\right\}$ to make as before

For the Projection at the Center

Take 67° 30′ from off the Chords and set it from D to E on the Primitive then draw a right Circle E C F then take 33° 45′ from off the ∠ Tangents and set it from C to B then sweep a great Circle thro the three points C B & H and it will form the Triangle C A B C as required



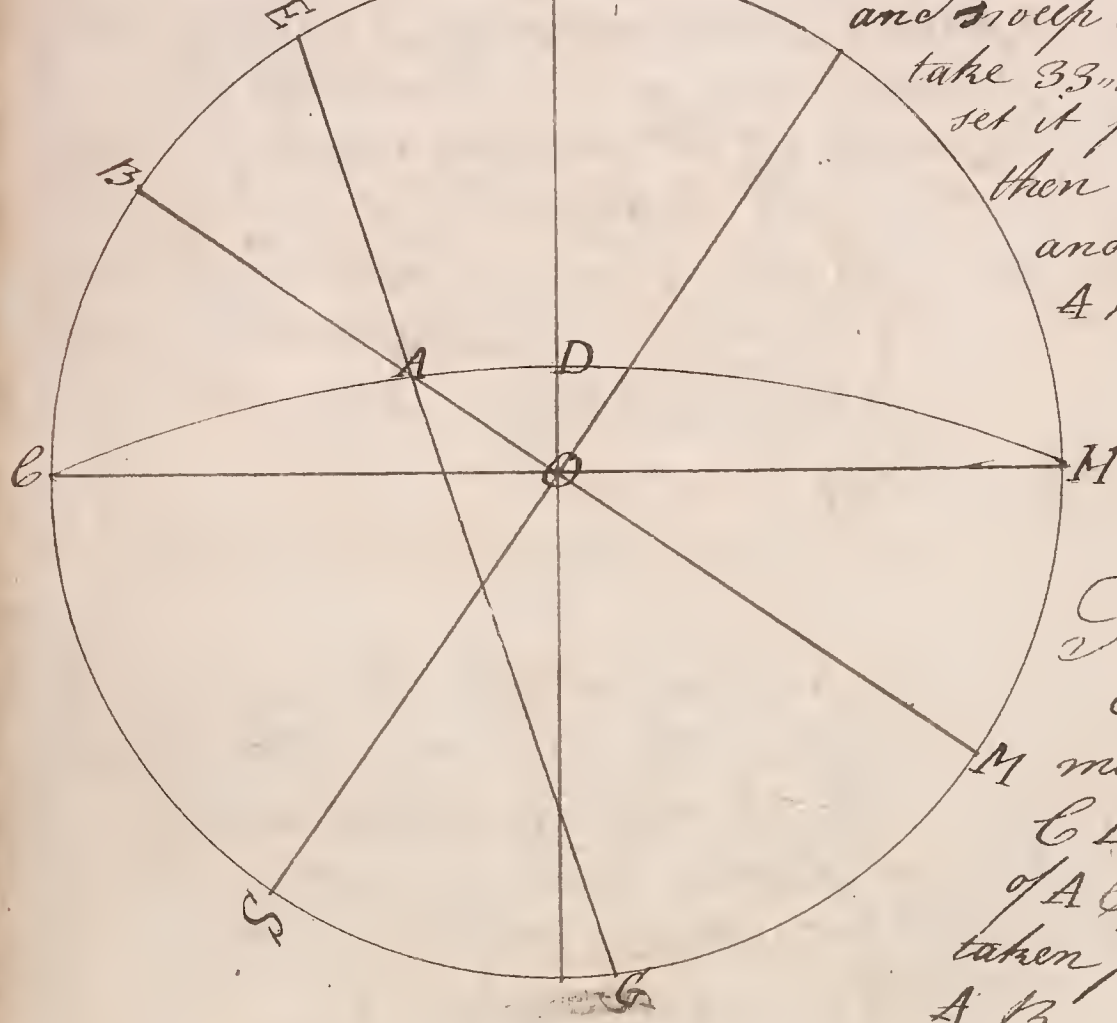
To measure the things required

E M N on the Chords is the measure of the angle A B C

A on the ∠ Tangents is the measure of A C / D Q on the Chords is the measure of A B

For the Projection at the Circumference

Take the Secant of the given angle and sweep a great Circle C D H then take 33° 45′ from off the Chords and set it from C to B on the Primitive then draw a right Circle B O M and it will form the Triangle A B C as required

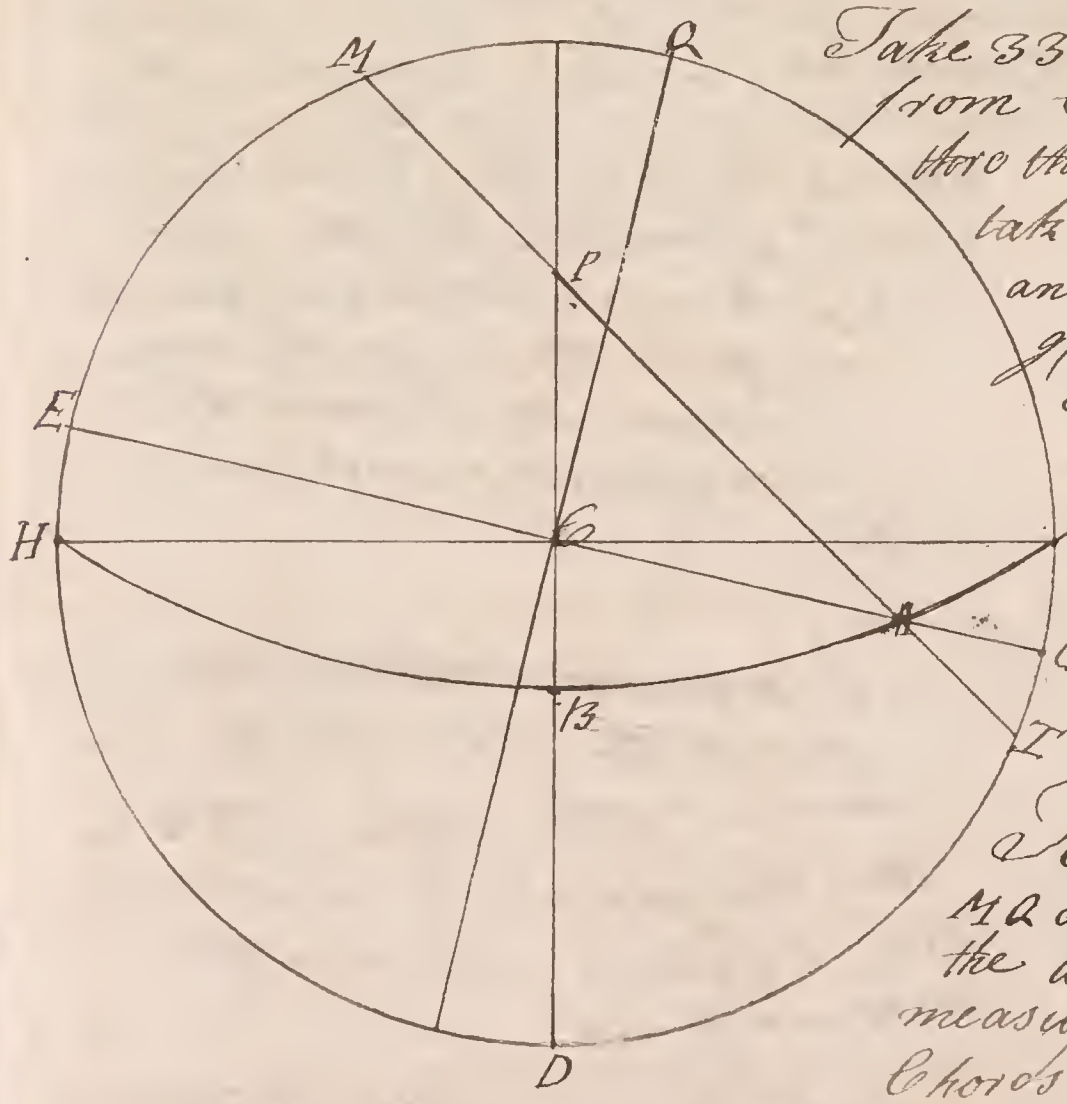


To measure the things Required

C S on the Chords is the measure of the angle A C E on the Chords is the measure of A C / A O on the ∠ Tangents and taken from 90 will give the Side A B

Case 7 } Supr BC = 33° : A5' } To make as before
Given } Hypot AC = 72 : 00 }

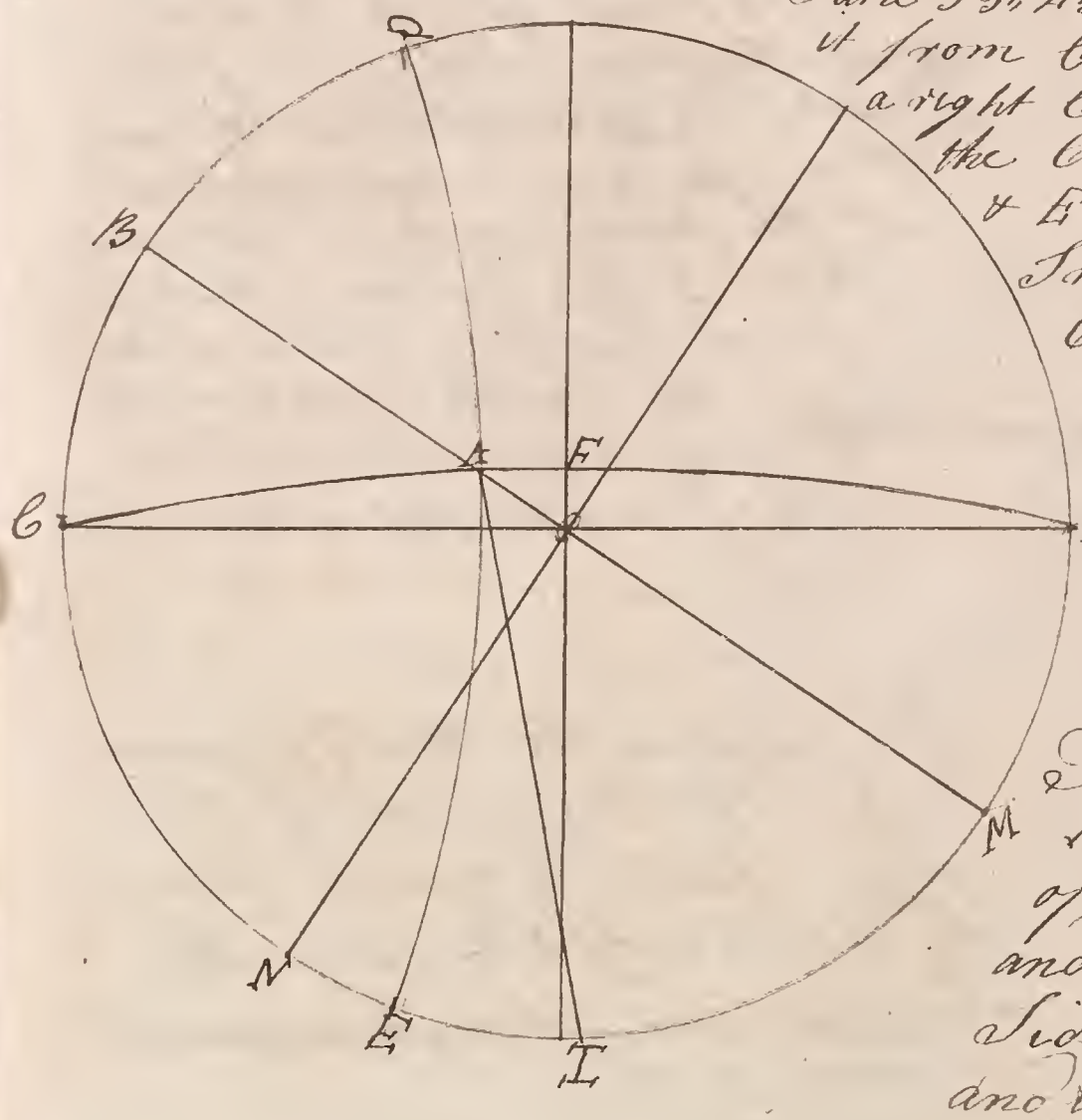
For the Projection at the Center



Take 33 : 45 off the ∠ Tangents and set it from C to B then sweep a great Circle thro the three points H B & E then take 72 from off the ∠ Tangents and set it from C to Cut the great Circle in A thro which draw a right Circle C & E and it will form the Triangle F A B C as Required

To measure the things Required
M Q on the Chords is the measure of the angle A / D C on the Chords is the measure of the angle C / D E on the Chords is the measure of the Side A B.

For the Projection at the Circumference

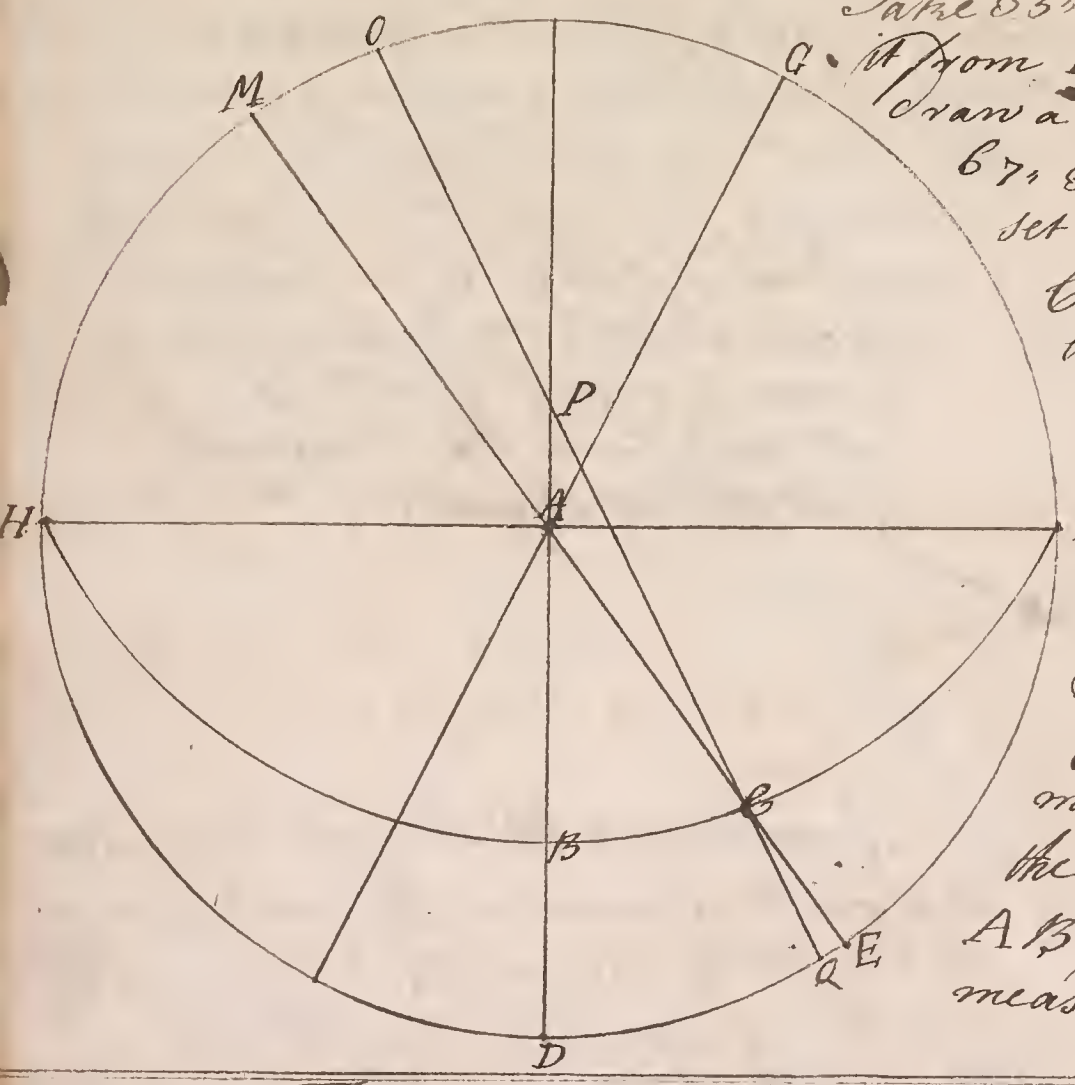


Take 33, 45 from off the ∠ Tangents and set it from C to B on the Primitive then draw a right Circle B O A then take 72 from off the Chords and set it from C to C & E then with the Tangent thereof Sweep a Circle to Cut the great Circle in A thro which and the two point Sweep a great Circle and it will form the Triangle A B C as Required

To measure the things Requir
N I on the Chords is the measure of the angle A / O A on the ∠ Tangents and taken from 90 will give the Side A B / O E on the ∠ Tangents and taken from 90 is the measure of the angle C

Case 8 { Hypot AC = 67° 30′ } To make as before
Given { Angle at A = 35° 50′ }

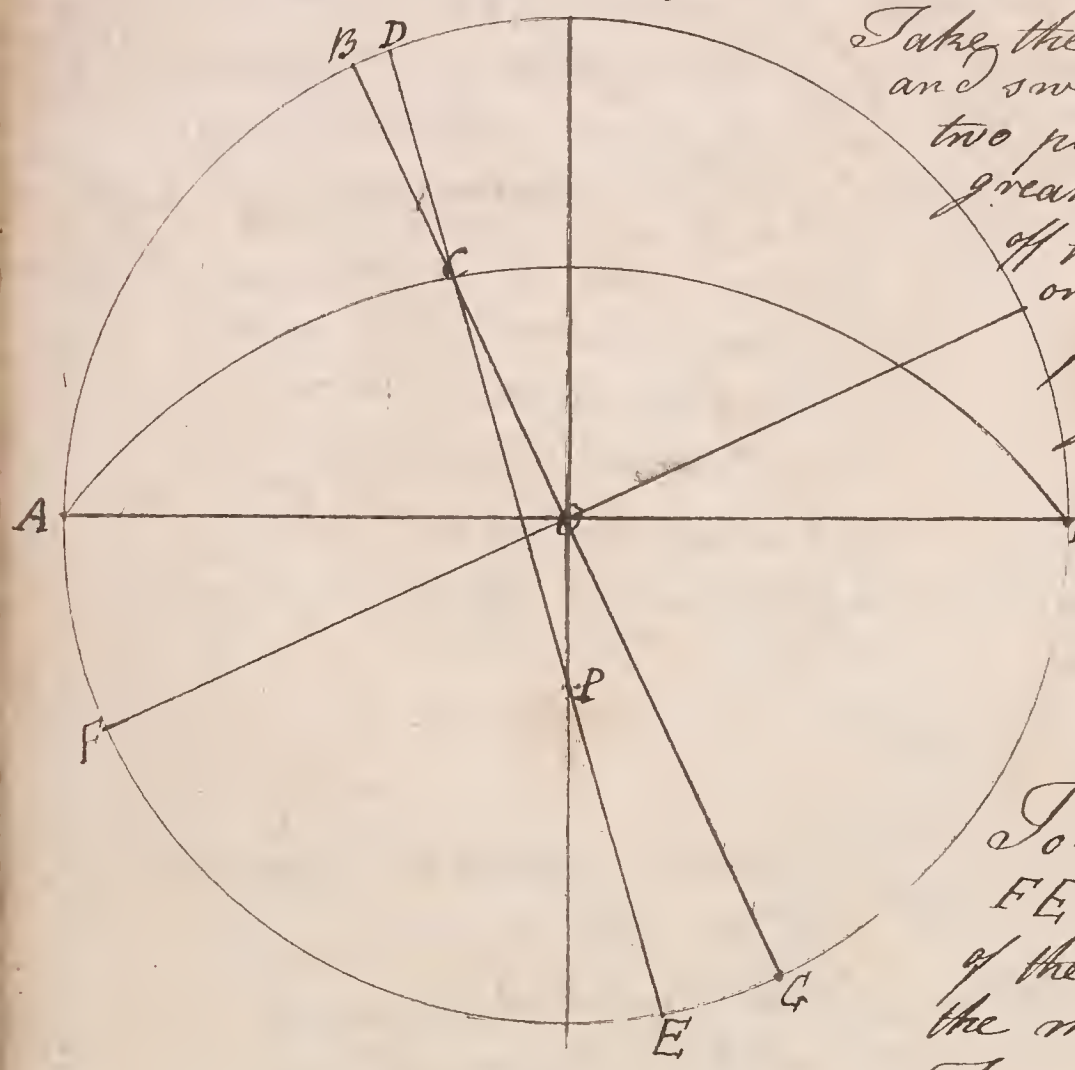
For the Projection at the Center



Take 35° 60′ from off the Chords and set it from D to E on the Primitive then draw a right Circle E A M then take 67° 30′ from off the ∠ Tangents and set it from A to C cut the right Circle in C thro which and the two points H & F sweep a great Circle and it will form the Triangle A B C as Required

To measure the things Requir'd
O G on the Chords is the measure of the angle C A B on the ∠ Tangents is the measure of A B / D Q on the Chords is the measure of B C

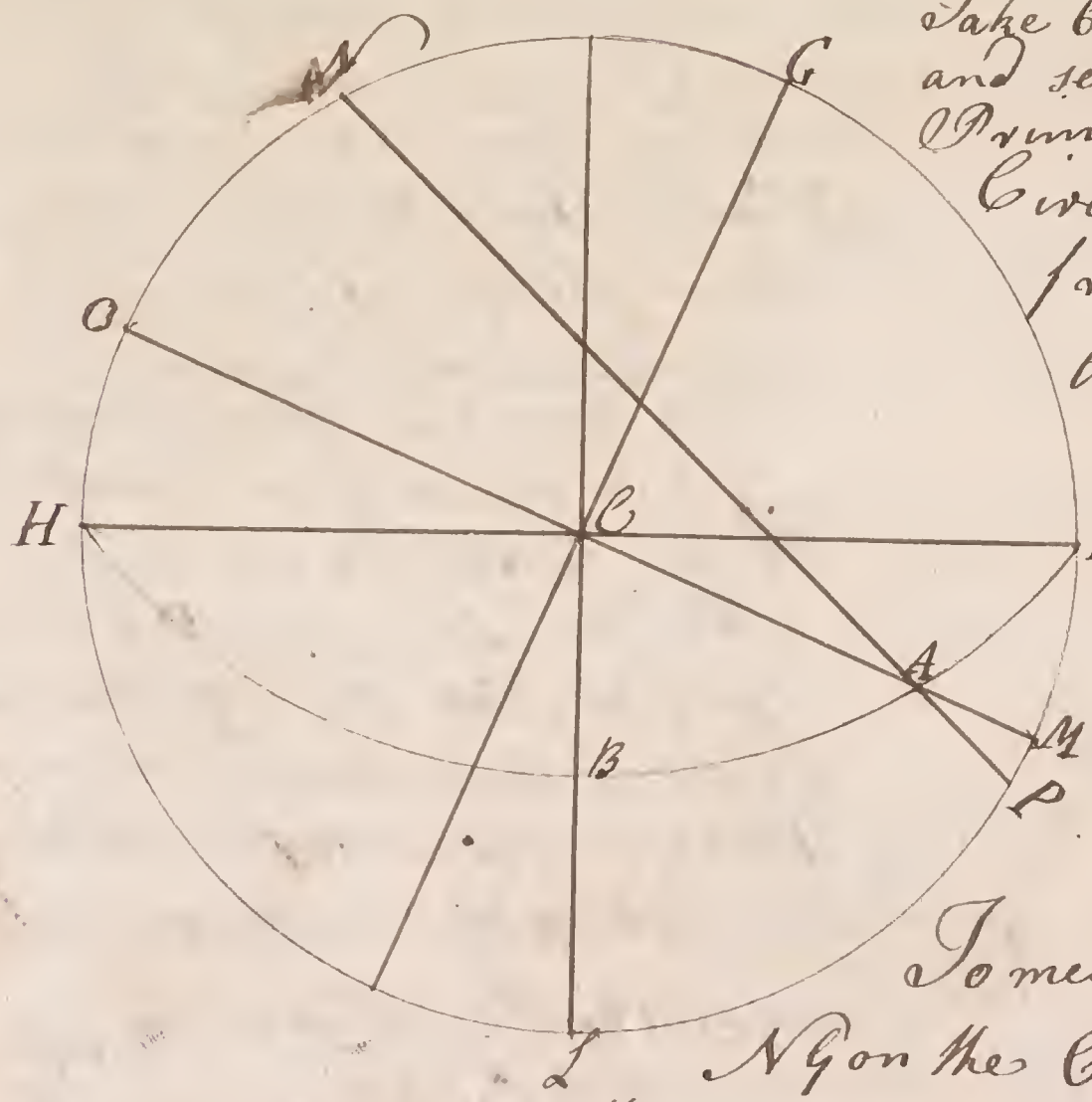
For the Projection at the Circumference



Take the Secant of the given Angle and sweep a great Circle thro the two points A & H find the Pole of the great Circle then take 67° 30′ from off the Chords and set it from A to D. on the Primitive then draw a line from D thro the Pole to Cut the great Circle in C thro which and the Center draw a right H Circle B O C and it will form the Triangle A B C as Required

To measure the things Required
F E on the Chords is the measure of the angle C A B on the Chords is the measure of A B / O C on the ∠ Tangents and taken from 90 is the measure of B C

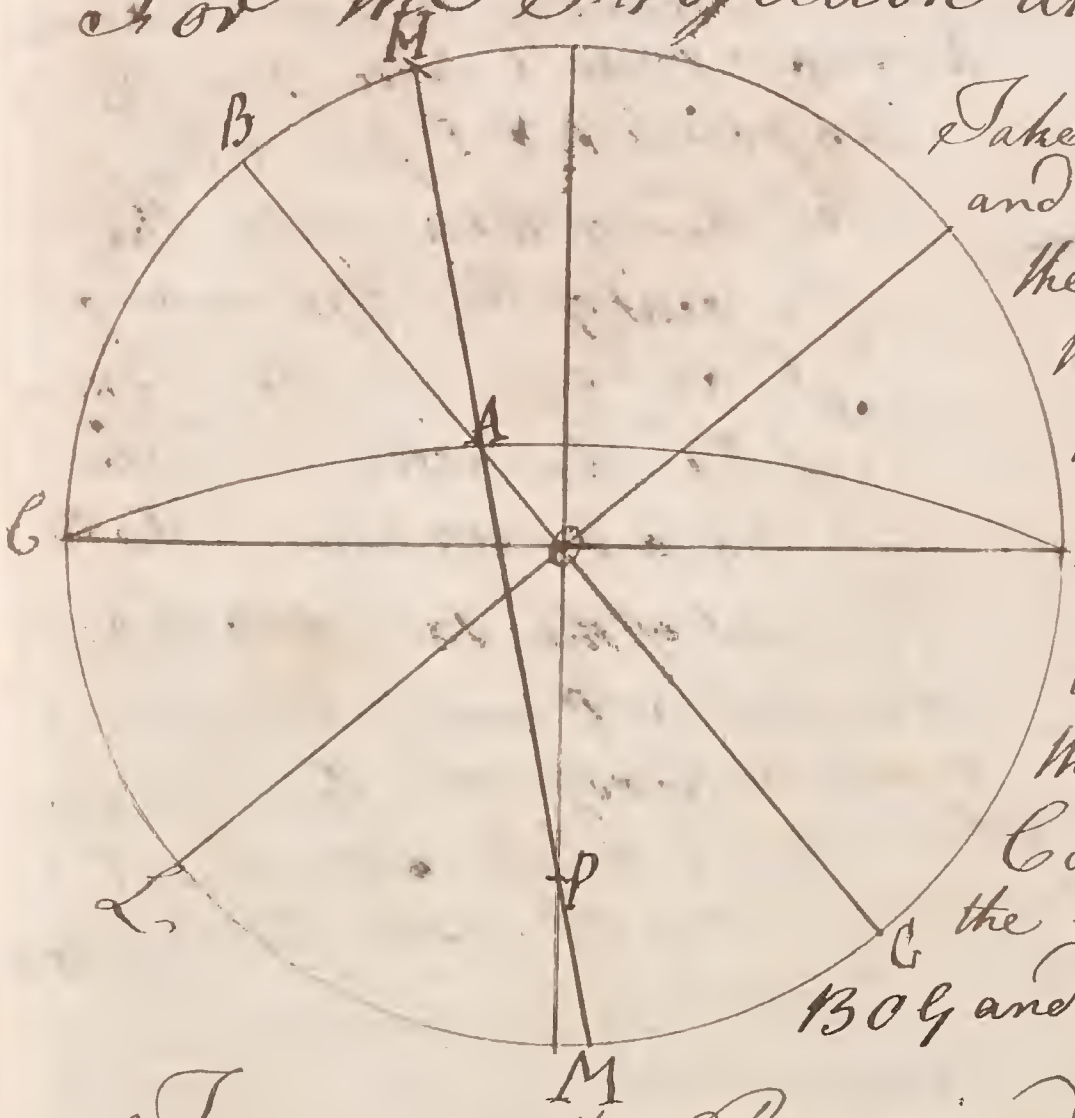
Case 2 { Hypot AC = 72° 15′ } To make as before
Given { Angle at C = 67° 30 }



Take 67° 30 from off the Chords and set it from L to M on the Primitive then draw a right Circle O C M then take 72° 15 from off the ∠ Tangents and set it from C to A on the right Circle thro which and the two F points H & E sweep a great Circle and it will form the Triangle A B C as Required ——

To measure the things Required N G on the Chords is the measure of the angle A. C B on the ∠ Tangents is the measure of C B L P on the Chords is the measure of A B

For the Projection at the Circumference



Take the Secant of the given and sweep a great Circle thro the two points C and F find the Pole of the great Circle then take 72° 15 from off the Chords and set it from C to H on the Primitive then draw a line from H thro the Pole to Cut the Great Circle in A thro which and the Center draw a right Circle B O G and it will the Triangle A B C as Required

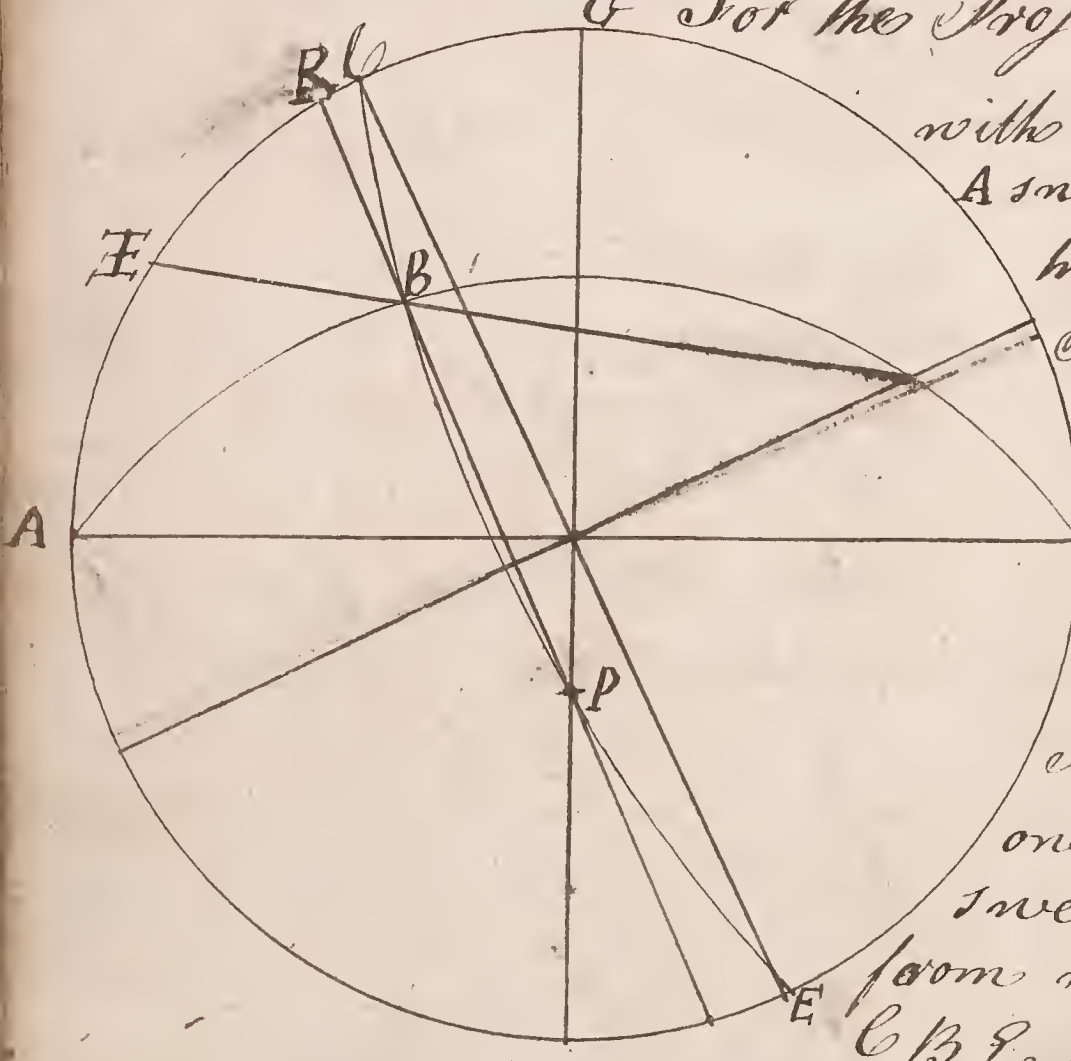
To measure the Required L M on the Chords is the measure of the angle A. C B on the Chords is the measure of C B & O A on the ∠ Tangents and taken from 90° is the measure of A B ——

Case 10 } Angle a = 34° 25′ } To make as before
Given } Angle C = 72° 10′ }

Take the angle A from off the Chords and set it from E to G on the Primitive then draw a right Circle S G A L find P S the Poles thereof then take 72° 10′ from off the Chords and set it from S to E & S to M on the Primitive then with the Tangent thereof sweep the Circle M C E mark where that cutts the Diameter D E in C find the Pole thereof then draw a great Circle thro the three points H B & E and it will form the Triangle A B C as Required

To measure the things Required

A C on the ℄ Tangents is the measure of A C / A B on the ℄ Tangt. is the measure of A B / F K on the Chords is the measure of the Side B C



For the Projection at the Circumference with the Secant of the given angle A sweep a great Circle thro the two points A & F find P the Pole thereof then with the Tangent of the given angle C and one in the Center of the Primitive Circle make a sweep also with the Secant of the said angle and one foot in P make a nother sweep to Cross the former M H from whence sweep the Circle C B E and it will form the Triangle A B C as Required

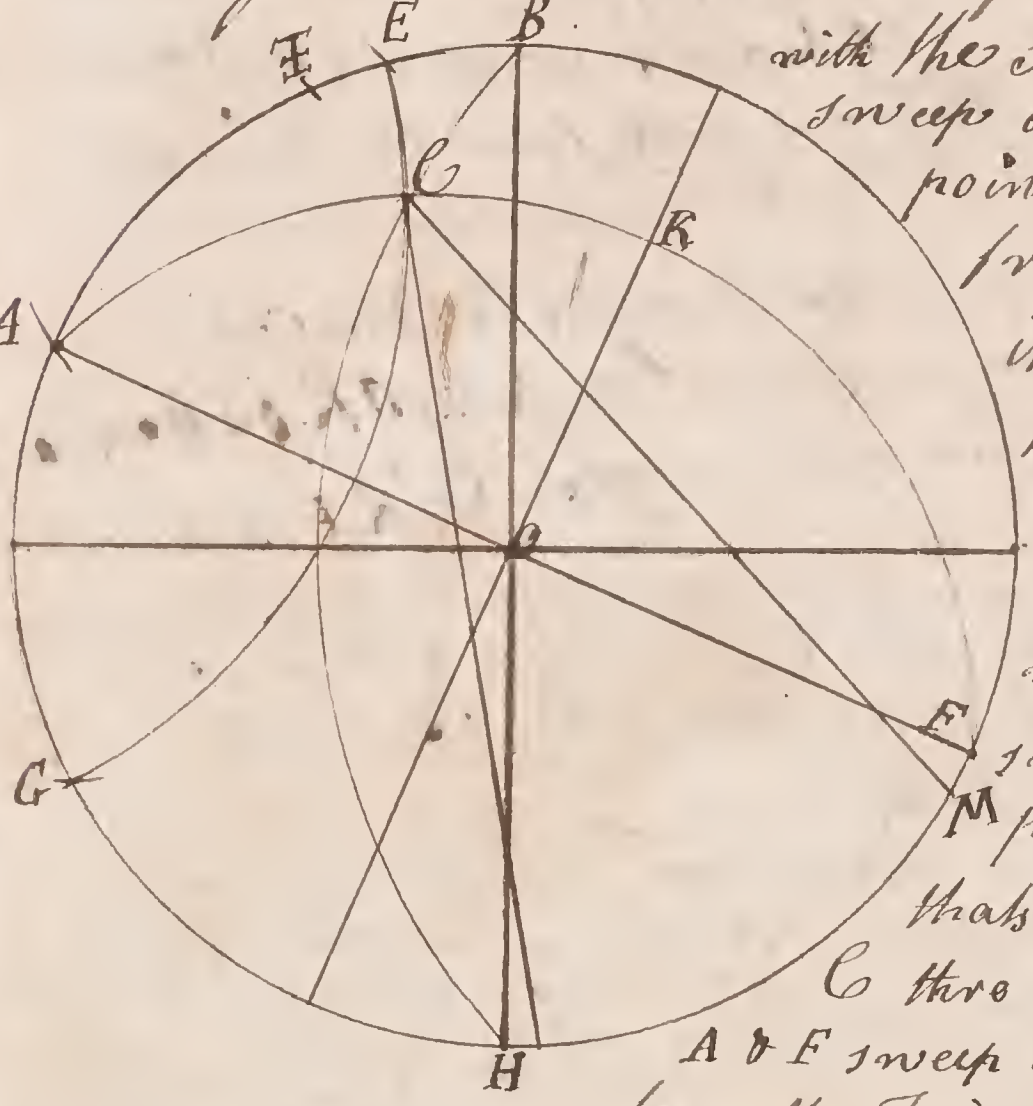
To measure the Things Required

A C on the Chords is the measure of A C / A R on the Chords is the measure of the Side A B / E G on the Chords is the measure of the Side B C

Oblique angled Spherical Trigonometry performed Geometrically

Case 1 Given } Two sides & an angle oppovite to one of them

Viz: } Base AB = 67° : 20 } With them it is req. to make
Side AC = 51 : 15
Angle at B = 46 : 40 } an oblique angled Spherical Triangle

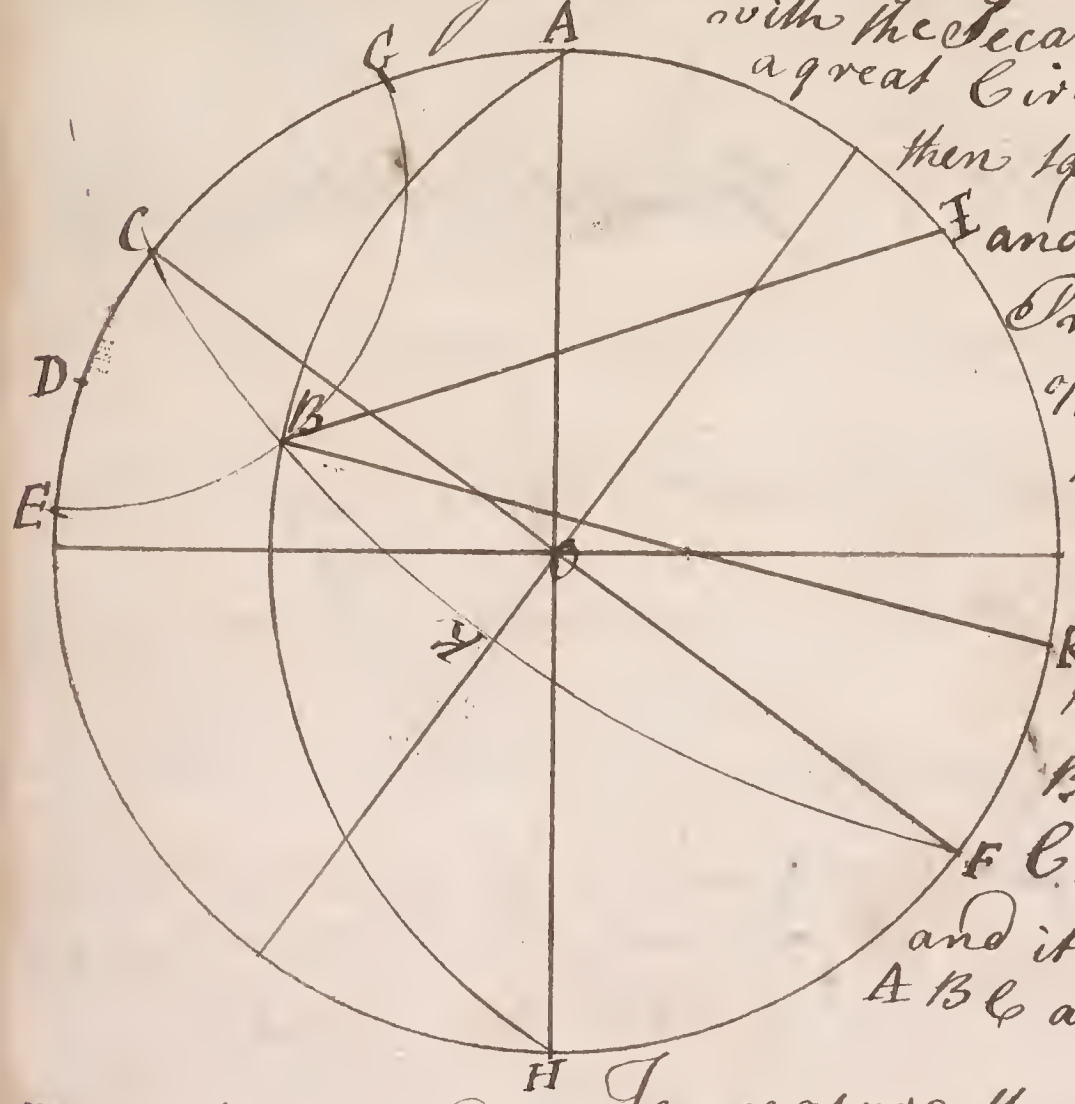


with the Secant of the Given angle sweep a great Circle thro the two points B & H then take 67° 20 from off the Chords and set it from B to A on the Primitive then take 51° 15 from off the Chords and set it from A to E & G on the Primitive and with the Tangent there of sweep a Circle thro the two points E & G mark where that Cuts the Great Circle in C thro which and the two points A & F sweep a great Circle and it will form the Triangle A B C as Required

To measure the Things Required

F B on the Chords is the measure of the Side B C / H M on the Chords and taken from 180 is the measure of the angle C / O K on the ∠ Tangents and taken from 90 is the measure of the ang. A

Do. Given { Side AC = 54° : 20′ ; Side BC = 32 : 15 ; Angle at A = 28 : 50 } To make as before

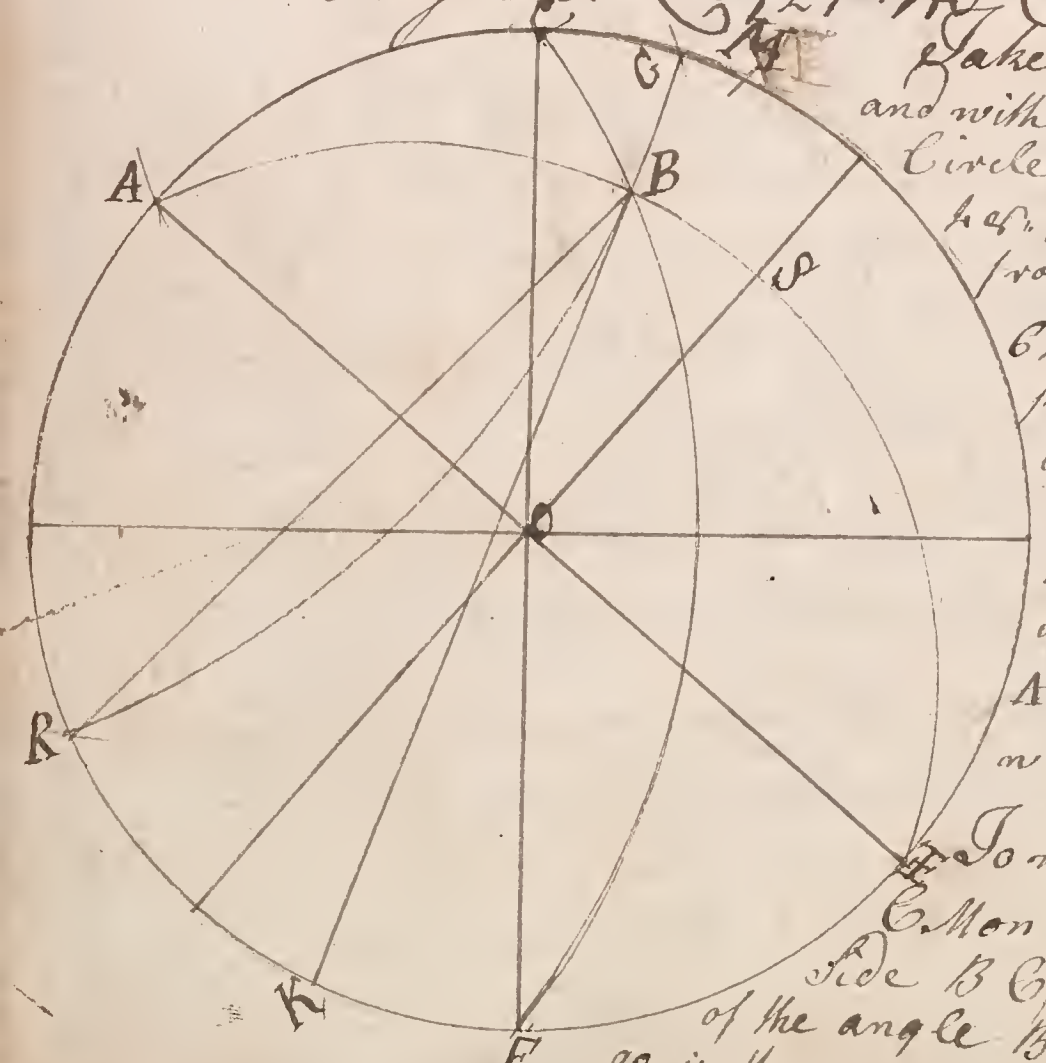


with the Secant of the Given angle sweep a great Circle thro the two points A & H then take 54 : 20 from off the Chords and set it from A to C on the Primitive then take 32 : 15 from off the Chords and set it from C to G & E and with the Tangent thereof sweep a Circle thro the two points E & G mark where that Cuts the great Circle in B thro which and the two points C and E sweep a great Circle and it will form the Triangle A B C as Required

To measure the things Required

D A on the Chords is the measure of the Side A B / O K on the Tangents and added to 90 is the measure of the angle C / R E on the Chords is the measure of the angle B

Do. Given { Base AB = 68° : 15 ; Side AC = 48 : 30 ; angle at C = 121 : 45 } To make as before



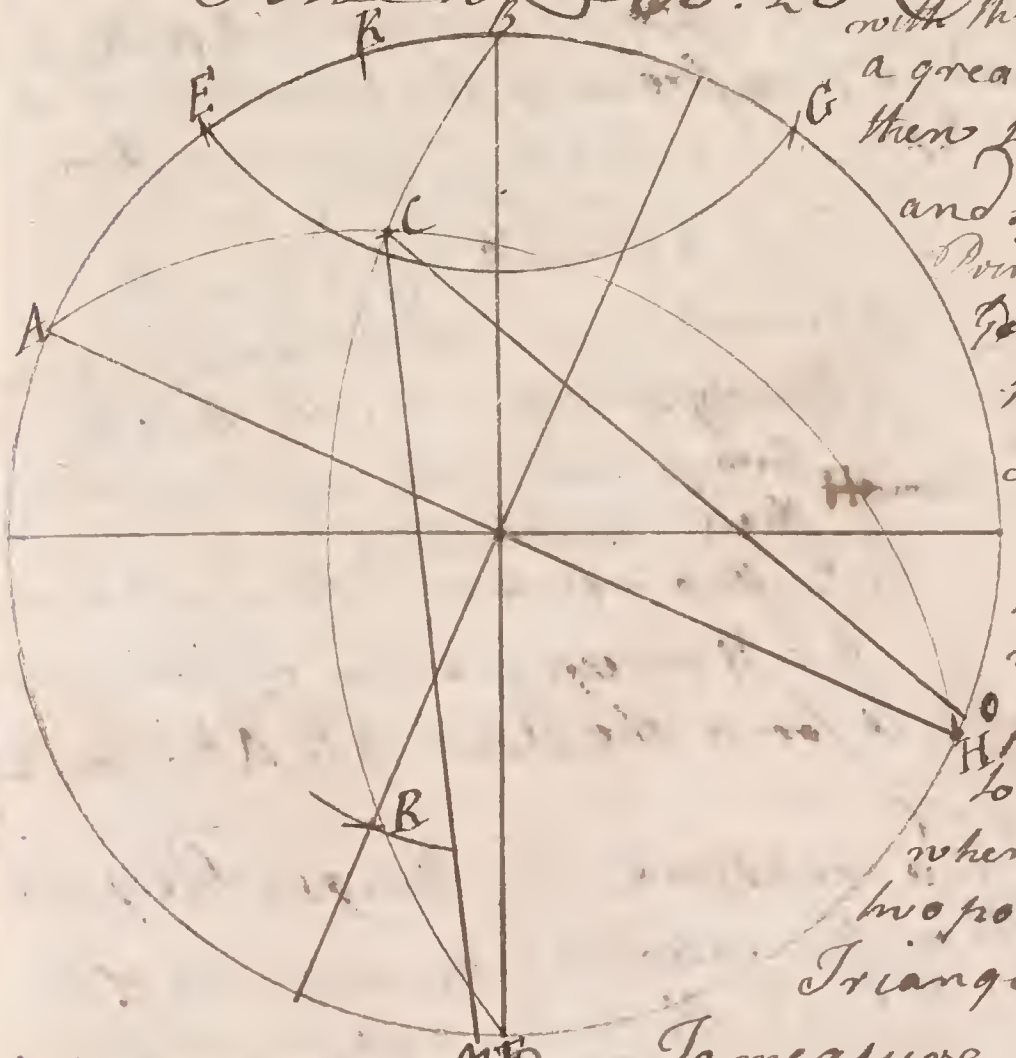
Take the Given angle 121 : 45 from 180 and with the Secant thereof sweep a great Circle thro the two points C & E then take 48 : 30 from off the Chords and set it from C to A on the Primitive then take 68 : 15 from off the Chords and set it from A to R & C on the Primitive and with the Tangent thereof sweep a Circle thro the two points C & R mark where that Cuts the Great Circle in B thro which and the two points A & E sweep a great Circle and it will form the Triangle A B C as Req:

To measure the things Required

C M on the Chords is the measure of the Side B C / R K on the Chords is the measure of the angle B / O S on the Tangents and taken from 90 is the measure of the angle A

Case 2 } Two angles & a side opposite to one of them
Given }

Viz^{l} } angle a = 32° : 40
angle B = 51 : 15
Side BC = 36 : 20
} To make as before

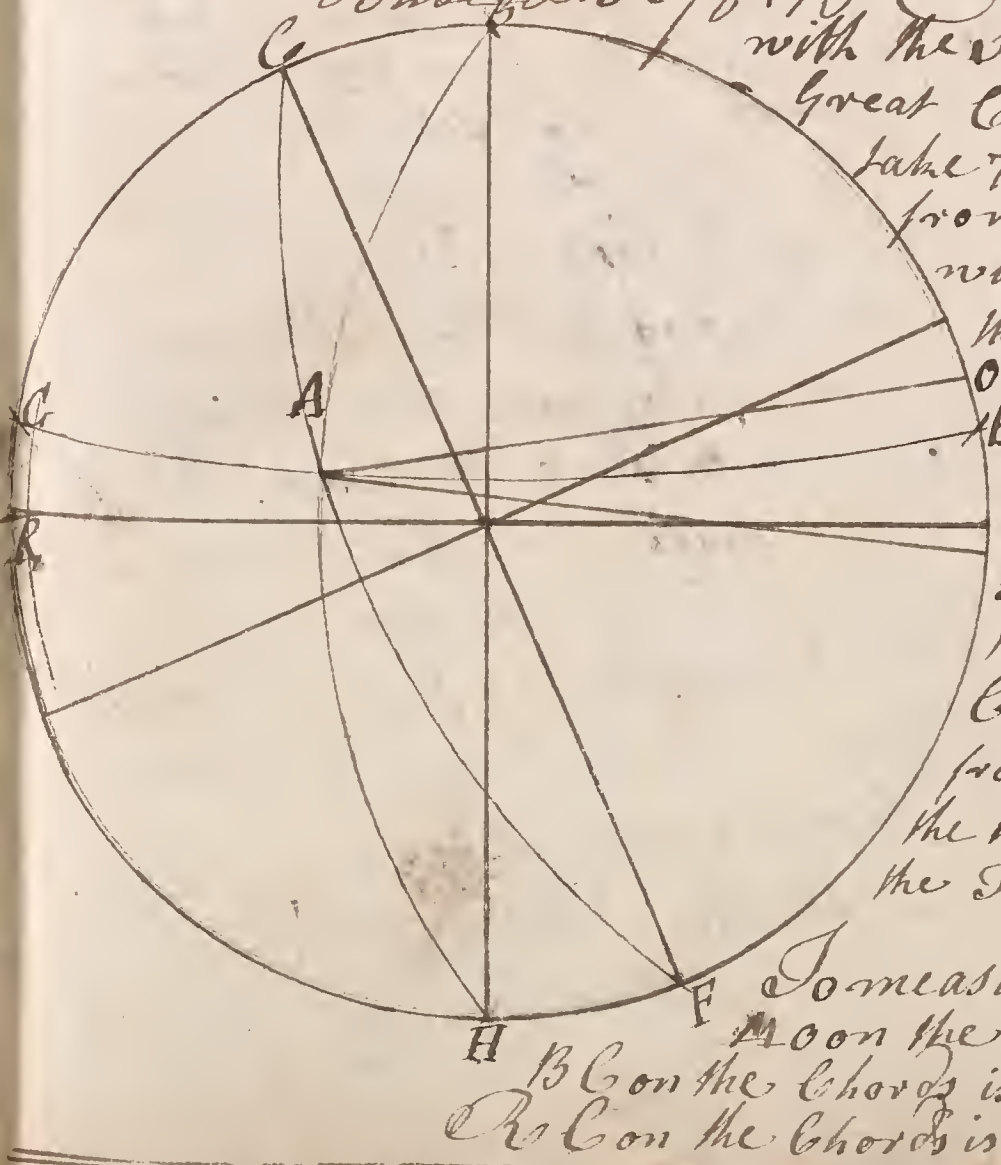


with the Secant of the Given angle B sweep a great Circle thro the two points A & H then take 36 : 20 from off the Chords and set it from B to G & C on the Primitive and with the Tangent of the ~~Given angle A~~ sweep a Circle thro the two points C & G then with the Tangent of the Given angle A 32 : 40 and one foot in the Center of the Primitive sweep a Circle then with the Secant thereof and one foot in C make another sweep to Cross the former sweep in R from whence sweep a great Circle thro the two points A & H and it will form the Triangle A B C as Required

To measure the things Required

A B on the Chords is the measure of the Side A B / A K on the Chords is the measure of the Side A C / M C on the Chords taken from 180 is the measure of the angle C /

Do } angle B = 51° : 25
Given } angle C 119 : 40
Base A B = 78 : 15
} To make as before



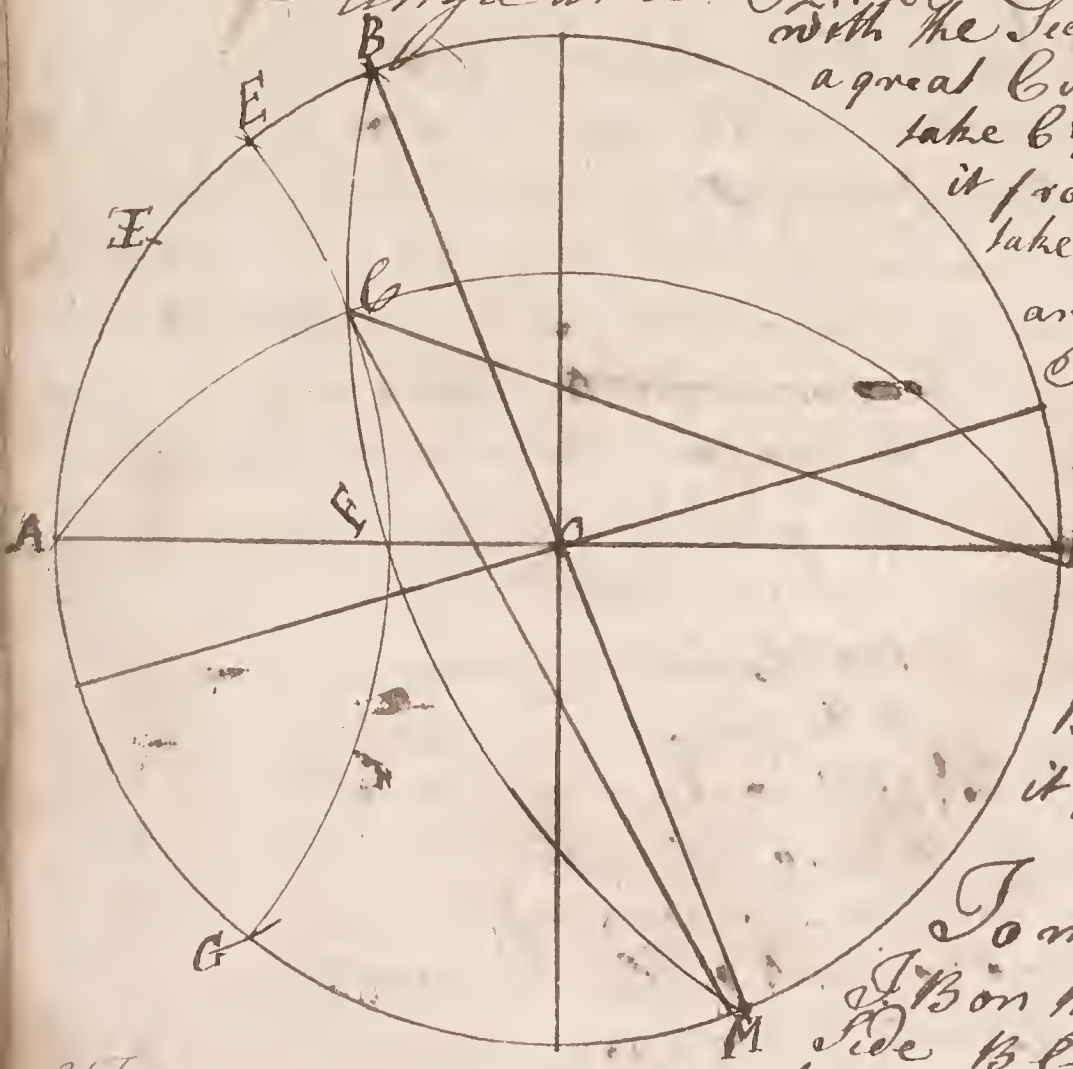
with the Secant of the given angle B sweep a Great Circle thro the two points C & B then take 78 : 15 from off the Chords and set it from B to G & C on the Primitive and with the Tangent thereof sweep a Circle thro the two points G and C then take the given angle C from 180 and with the Tangent thereof and one foot in the Center of the Primitive sweep a Circle then with the Secant thereof and one foot in A sweep on the Circle to Cut the former Circle in P from whence sweep a great Circle thro the three points C A & P and it will form the Triangle A B C as Required

To measure the things Required

Upon the Chords is the mesure of the angle A
B C on the Chords is the measure of the Side B C /
R C on the Chords is the measure of the Side A C /

Case 3 Given } Two Sides and their contained Angle

Viz.[1] } Base AB = 67°:20 / Side AC = 51°:15 / Angle at A = 32°:25 } To make as before



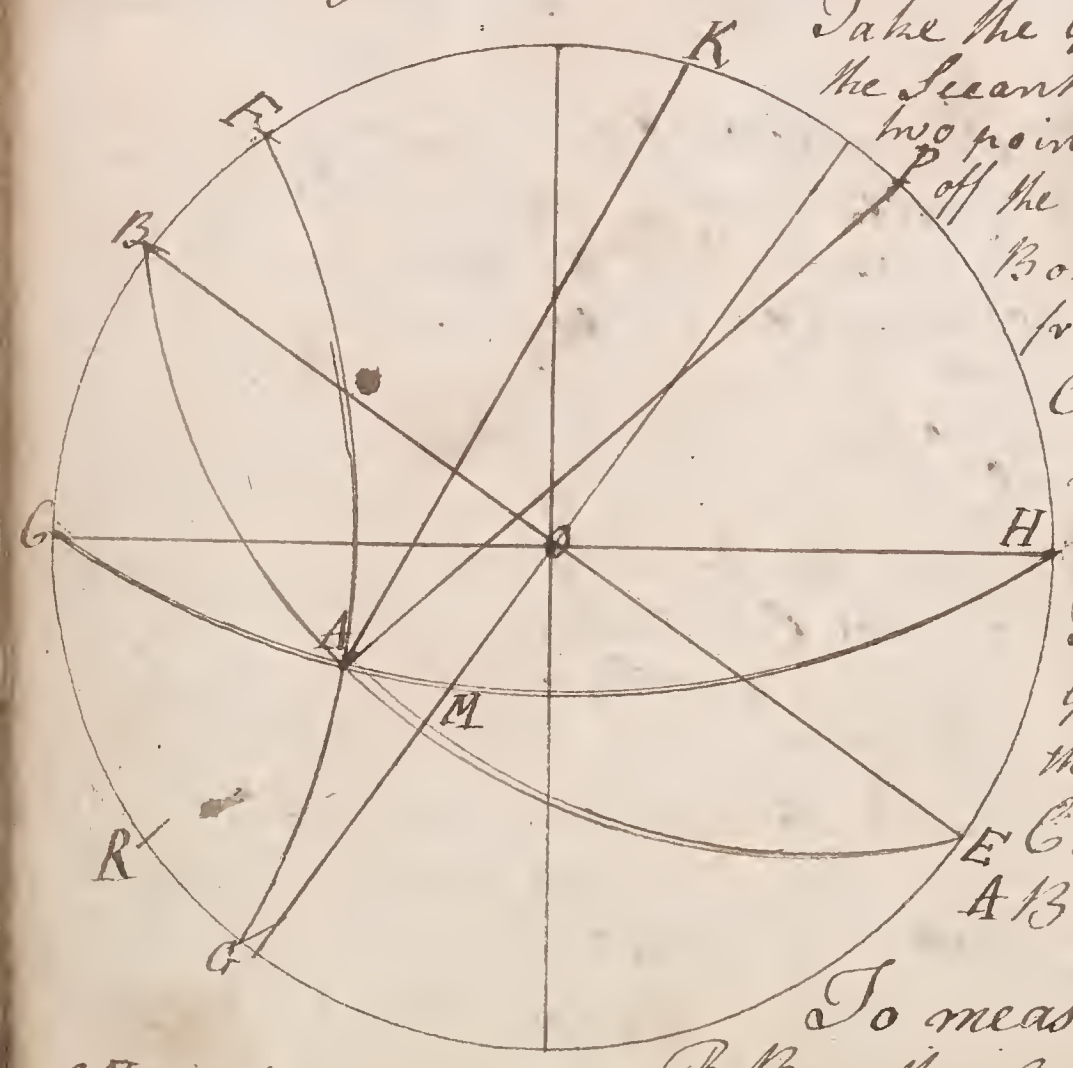
with the Secant of the given Angle A sweep a great Circle thro the two points A & E then take 67°:20 from off the Chords and set it from A to B on the Primitive then take 51°:15 from off the Chords and set it from A to C & C on the Primitive and with the Tangent thereof sweep a Circle thro the two points E & C mark where that Cuts the great Circle in C thro which and the two points B & M sweep a great Circle and it form the Triangle ABC as Req.

To measure the things Required

1 B on the Chords is the measure of the Side BC H M on the Chords and taken from 180 is the measure of the angle C

2 C on the ± Tangents and taken from 90 is the measure of the angle B

Ex. } Side AC = 52°:20 / Side BC = 35°:15 / angle at C = 123°:45 } To make as before



Take the Given Angle C from 180 and with the Secant thereof sweep a Circle thro the two points C & K then take 35°:15 from off the Chords and and set it from C to B on the Primitive then take 52°:20 from off the Chords and set it from C to G & G on the Primitive and with the Tangent thereof sweep a Circle thro the two points F & G mark where that Cuts the Great Circle in A thro which and the two points B & E sweep a great Circle and it will form the Triangle ABC as Required

To measure the Things Required

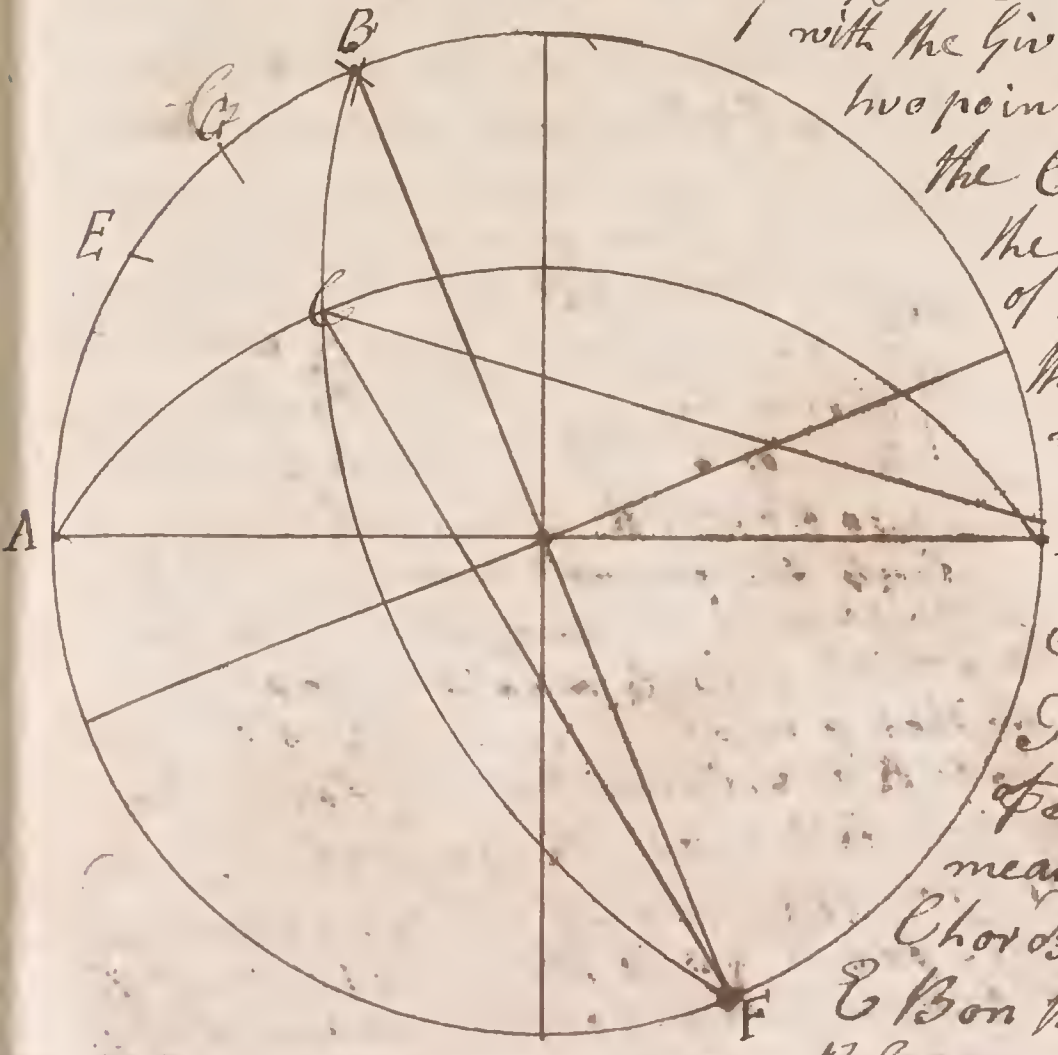
1 B on the Chords is the measure of the Side AB

2 M on the ± Tangents and taken from 90 is the measure of the Angle B

P K on the Chords is the measure of the angle A

Case A
Given } Two angles and their contained Side

Viz } angle a = 31° : 40'
angle B = 51° : 25'
Base AB = 67° : 15' } To make as before



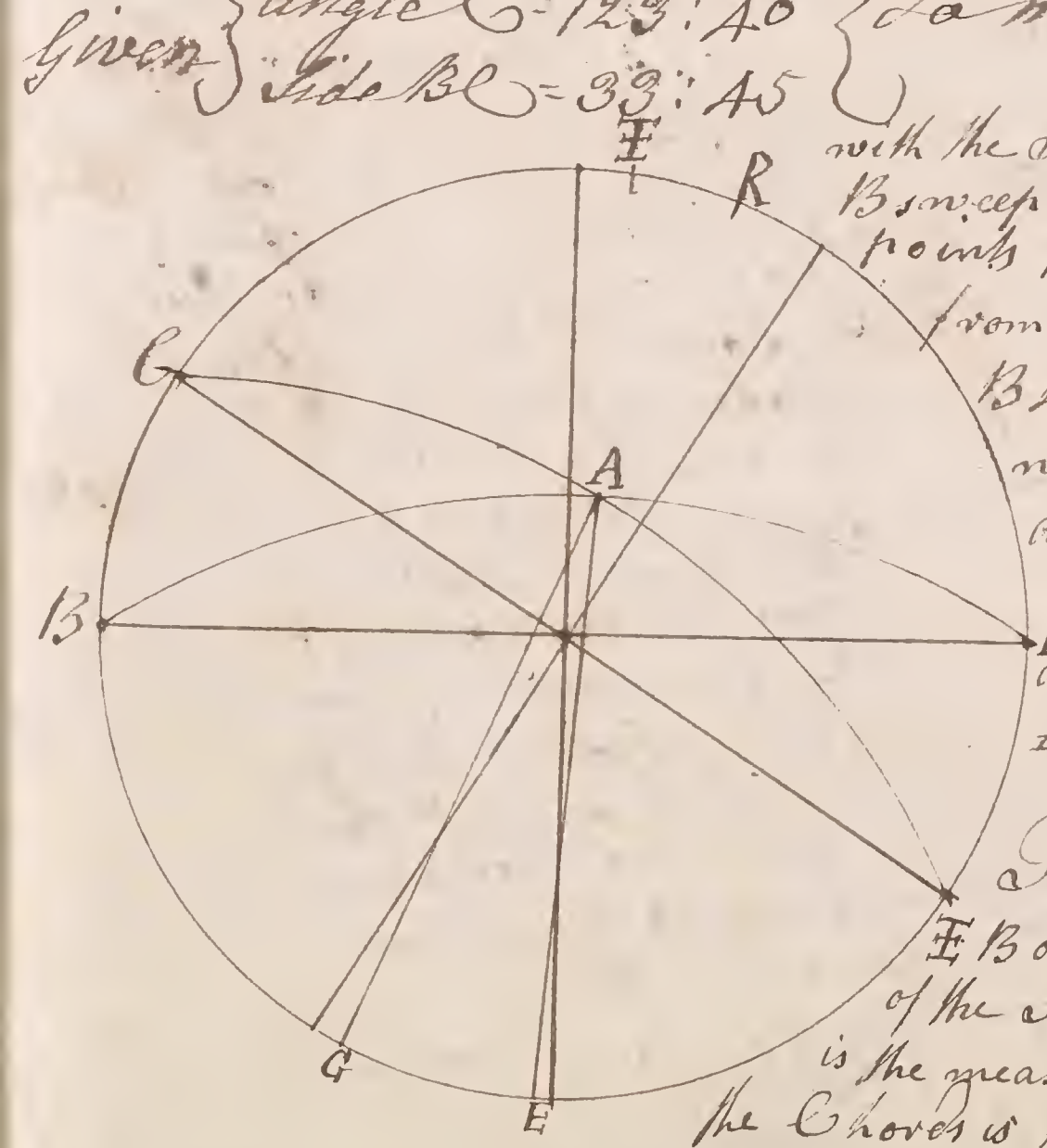
with the given angle A sweep a Circle thro the two points A & C then take 67° 30' from off the Chords and set it from A to B on the Primitive then with the Secant of 51° 15' sweep a great Circle thro the three points B C & F and it will form the Triangle A B C as Required

To measure the things Requir'd

1. H on the Chords is the measure of the and taken from 180 is the measure of the angle C A on the Chords is the measure of the Side A C
C B on the Chords is the measure of the Side

B C

Do } angle B = 56° : 15'
angle C = 123° : 40'
Given } Side BC = 33° : 45' } To make as before

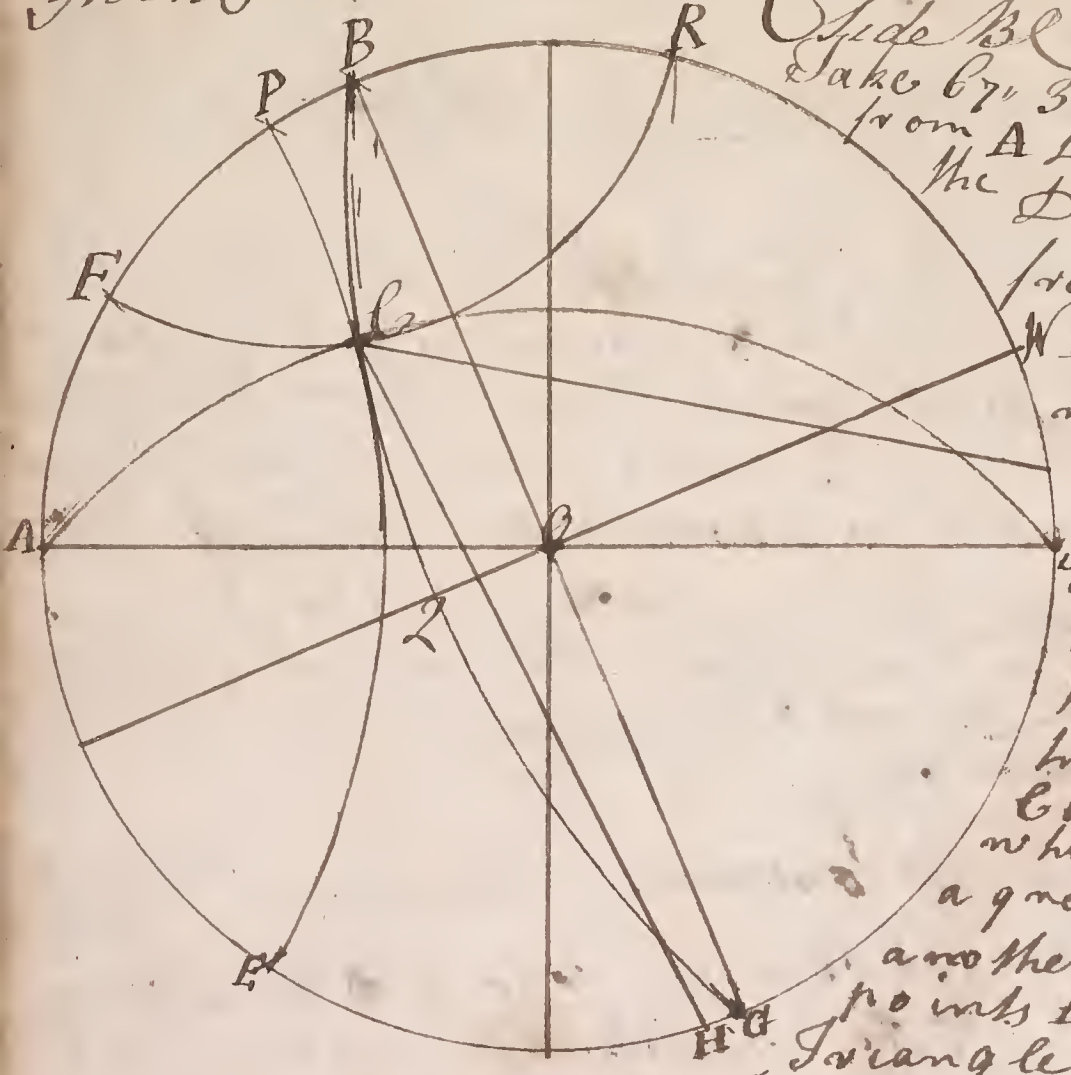


with the Secant of the Given angle B sweep a great Circle thro the two points B & F then take 33° 45' from off the Chords and set it from B to C on the Primitive then with the Secant of the Given angle C from 180 sweep a great Circle thro the two points C & R and it will form the Triang A B C as Required

To measure the things Req:

F B on the Chords is the measure of the Side A B / C R on the Chords is the measure of the Side A C / E C on the Chords is the measure of the angle A

Case 5 Given } The 3 Sides Viz! { Side AB = 67° : 30 / Side AC = 56 : 15 / Side BC = 37 : 20 } To make as before

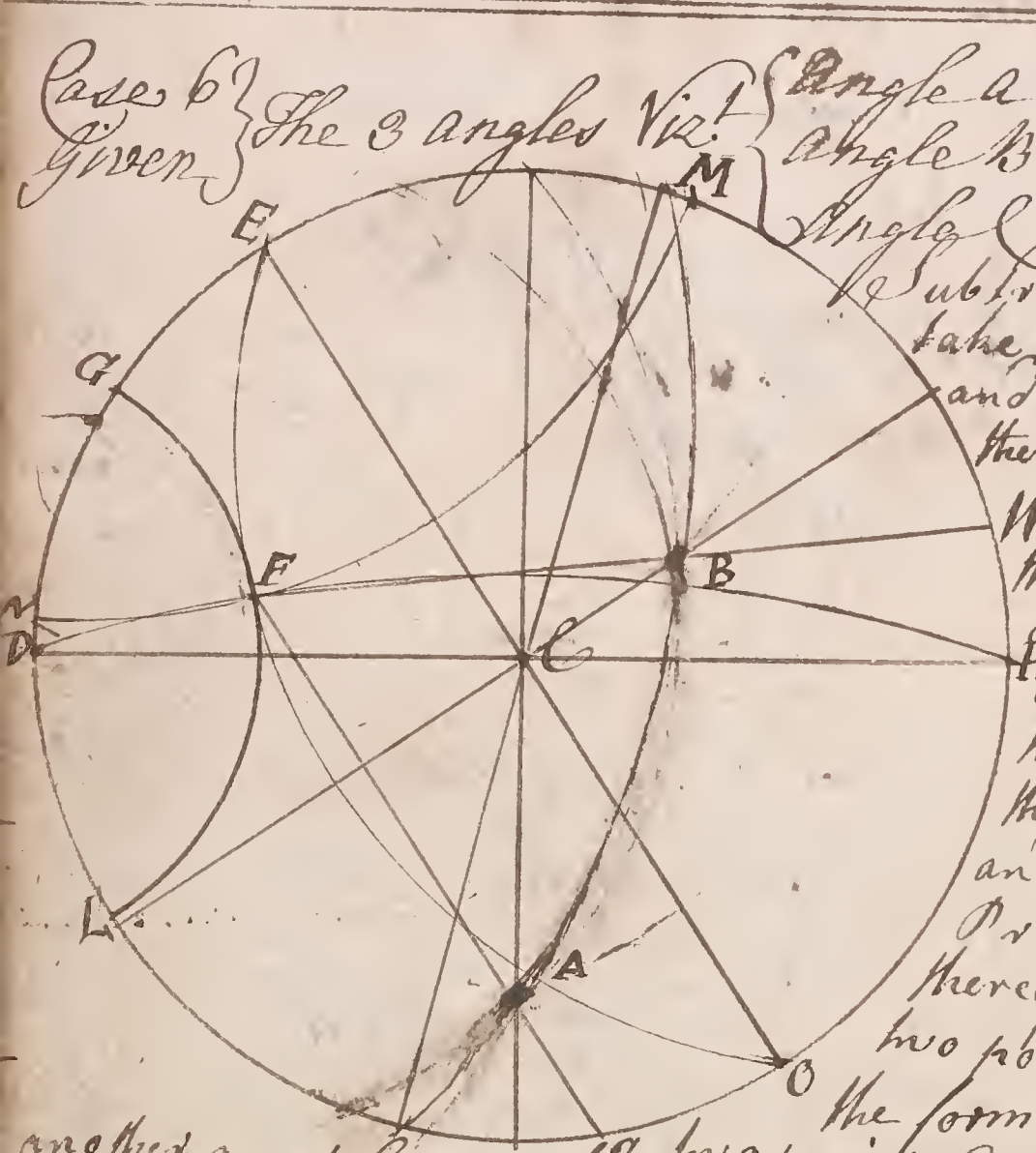


Take 67° 30 from off the Chords and set it from A to B on the Primitive then draw the Diameter BOG then take 56° 15 from off the Chords and set it from A to P & E on the Primitive then with the Tangent thereof sweep a Circle thro the two points P & E. then take 37° 20 from off the Chords and set it from B to R & F on the Primitive and with the Tangent thereof sweep a Circle thro the two points R & F mark where that Cuts the great Circle in C thro which and the two points B & G sweep a great Circle and it also sweep another great Circle thro the three points A C & S and it will form the Triangle ABC as Required

To measure the Things Required

OR on the ± Tangents and taken from 90 is the measure of the angle A/C OR on the ± Tangents and taken from 90 is the measure of the angle B/H Won the Chords is the measure of the Angle C

Case 6 Given } The 3 angles Viz! { Angle a = 32° : 40 / Angle B = 52 : 15 / Angle C = 123 : 25 } To make as before



Subtract the given angle C from 180 and take the Remainder from off the Chords and set it from D to C on the Primitive then Draw a right Circle E & O Then Take the given angle A from off the Chords and set it from D to G & L on the Primitive and with the Tangent thereof sweep a Circle thro the two points G & L then take the Given angle B from off the Chords and set it from E to N & M on the Primitive and with the Tangent thereof sweep a parr: Circle thro the two points M & N mark where that Cuts the former Circle in A thro which and the two points E & A sweep a great Circle also sweep another great Circle thro the three points D & H and it will form a Triangle D & H find A B C the Poles of the three Circles that form this Triangle thro which draw great Circles & you will have the Triangle A B C as Required

To measure the Things Required

A C on the ± Tangents is the measure of the Side A C / B C on the ± Tangents is the measure of the Side B C / S Won the Chords is the measure of the Side A B

Spherical Trigonometry Rectangular

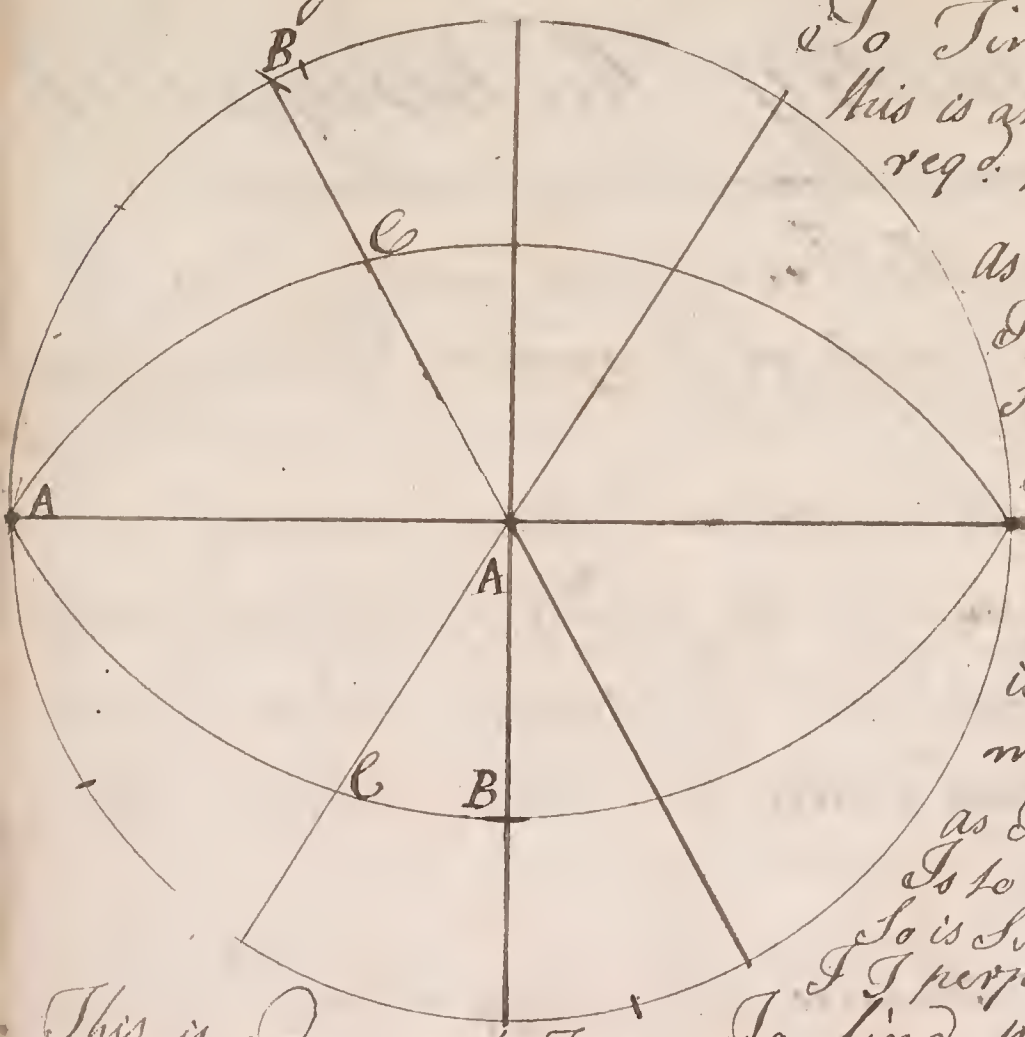
In solving any Case of Spherical Triangles we are first to Consider weather it be an adjunct or Disjunct Term. — a Term is said to be adjunct when if three parts viz. two given and one required have no Interruption the two ut most parts are called Extremes and that which lies between the middle part: But if there can Interruption, the Term is said to be Disjunct that which is seperated from the other two being called the middle part and the other two Extremes Disjunct.

In adjunct Termes, if the Hypothenuse or either of the angles happen to be Extremes they are Tangent Complements, but if the middle part ~~they are~~ they are then Sine Complements: also if the Base or perpendicular happen to be Extremes they are called Tangents, but if the middle part they are noted by their Sines.

In Disjunct termes if the Hypothenuse or either of the angles happen to be Extremes they are sines, but if the middle part they are then Sine Compliments: also if the Base or perpendicular are Extremes they are Called Sine Complements, but if the middle part they are Noted by their Sines. —

If the middle part be required Radius must lead: but if an Extreme be req^d the other Extreme must lead, weather the Term be adjunct or Disjunct

Case 1 } Base AB = 61° 15'
Given } Angle at A = 31° 40'
} To find the rest



To find the Hypot: AC

This is an adjunct term & an Extreme is req^d. therefore the other Extreme must lead

as Sine Base AB 61° 15' — 10.260729
To Radius 90° 00' — 10.
So is Sine Angle A 31° 40' — 9.929969
To Sine Hypot — 61.58 — 9.669260

To find the perpend: BC

This an adjunct term & an Extreme is req^d. therefore the other Extreme must Lead

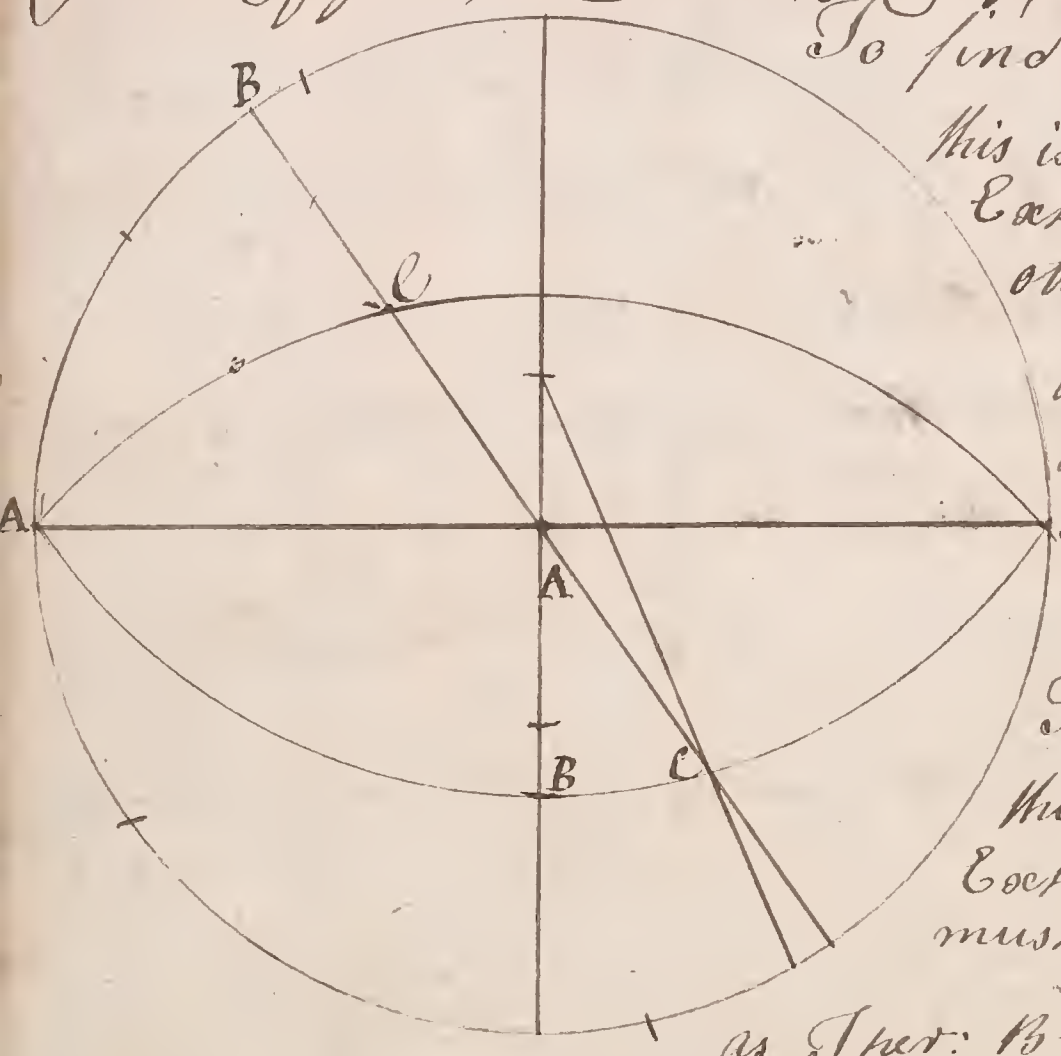
as Sine Angle A 31° 40' — 10.209649
Is to Radius 90° 00' — 10.
So is Sine Base 61° 15' — 9.942864
To Sine perp: BC 28° 25' — 9.733015

This is a adjunct Term must Lead

To find the angle C the middle part Required therefore Radius

as Radius	90° 00'	10
Is to Sine Base AB	61° 15'	9.682135
So is Sine angle A	31° 40'	9.720140
To Sine angle C	75° 23'	9.402275

Case 2 } Base AB = 56° 15'
Given } Perp BC = 33° 45'
} To find the rest



To find the angle C

This is an adjunct term and an Extrem is req^d. therefore the other Extrem must Lead

as Sine Base AB 56° 15' — 10.175107
Is to Radius — 90° 00' — 10
So is Sine Per: BC — 33° 45' — 9.744739
To Sine angle C 69° 34' — 9.569632

To Find the angle A

This is an adjunct term and an Extrem therefore the other Extreme must Lead

as Sine Per: BC — 33° 45' — 9.624893
Is to Radius — 90° 00' — 10.
So is Sine Base AB — 56° 15' — 9.919446
To Sine angle A — 36° 47' — 10.094953

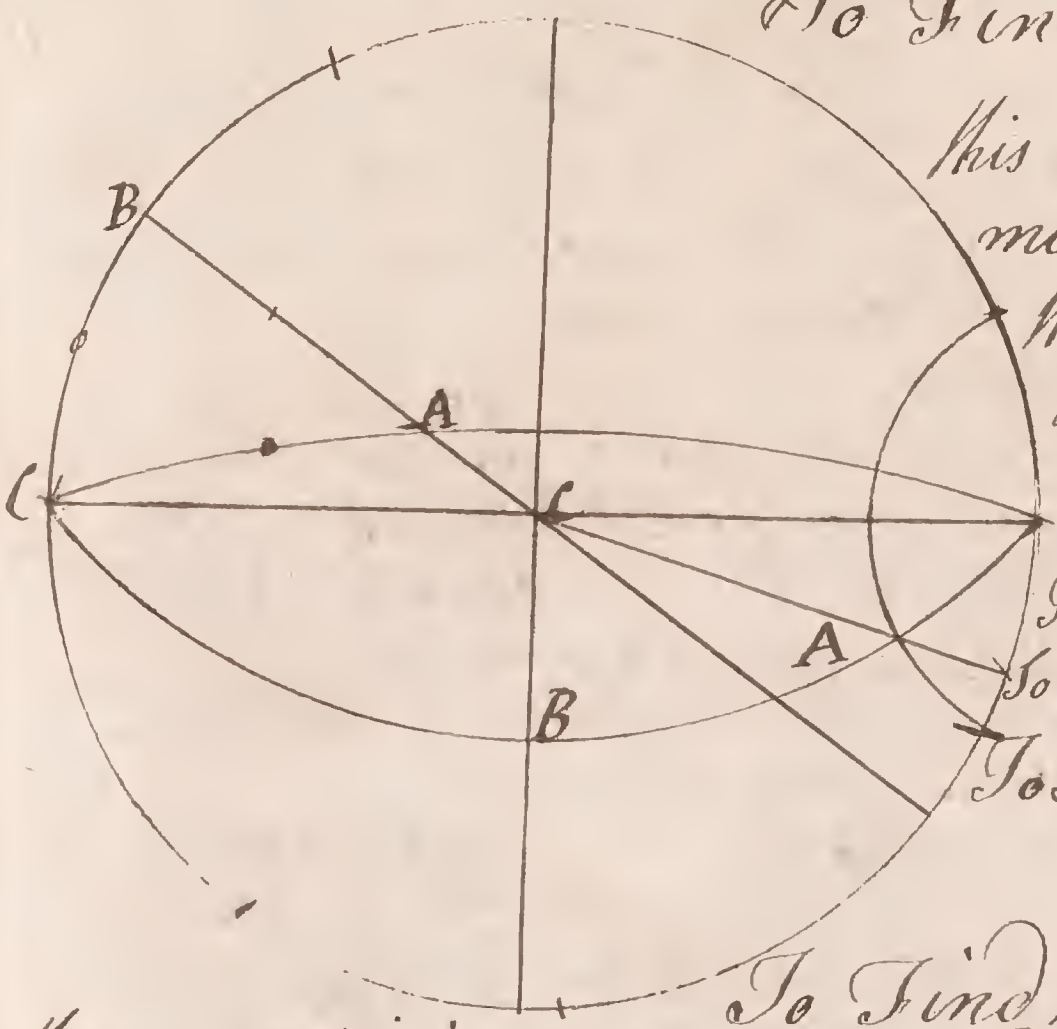
To find the Hypot ac

This is and adjunct term the middle part Required therefore Radius must Lead ——

as Radius	90 ° 00	10.
Is to S C Base ab	56 ° 15	9. 7 4 4 7 3 9
So is S C per: BC	33 ° 45	9. 9 1 9 8 4 6
To S C Hypot ac	62 ° 29	9. 6 6 4 5 8 5

Case 3 Given } Base ab = 64° 20′ ; Angle at C = 72° 15′ } To find the rest ——

To Find the perpendicular BC



This is an adjunct term the middle part Required therefore Radius must Lead.

as Radius	90 ° 00	10
Is to S Base ab	64 ° 20	9.9531826
So is S Angle C	72 ° 15	9.9505269
To S per: BC	41 ° 46	9.9823543

To Find the Hypot AC

This is a Disjunct term an Extrem is Required therefore the other Extrem must Lead

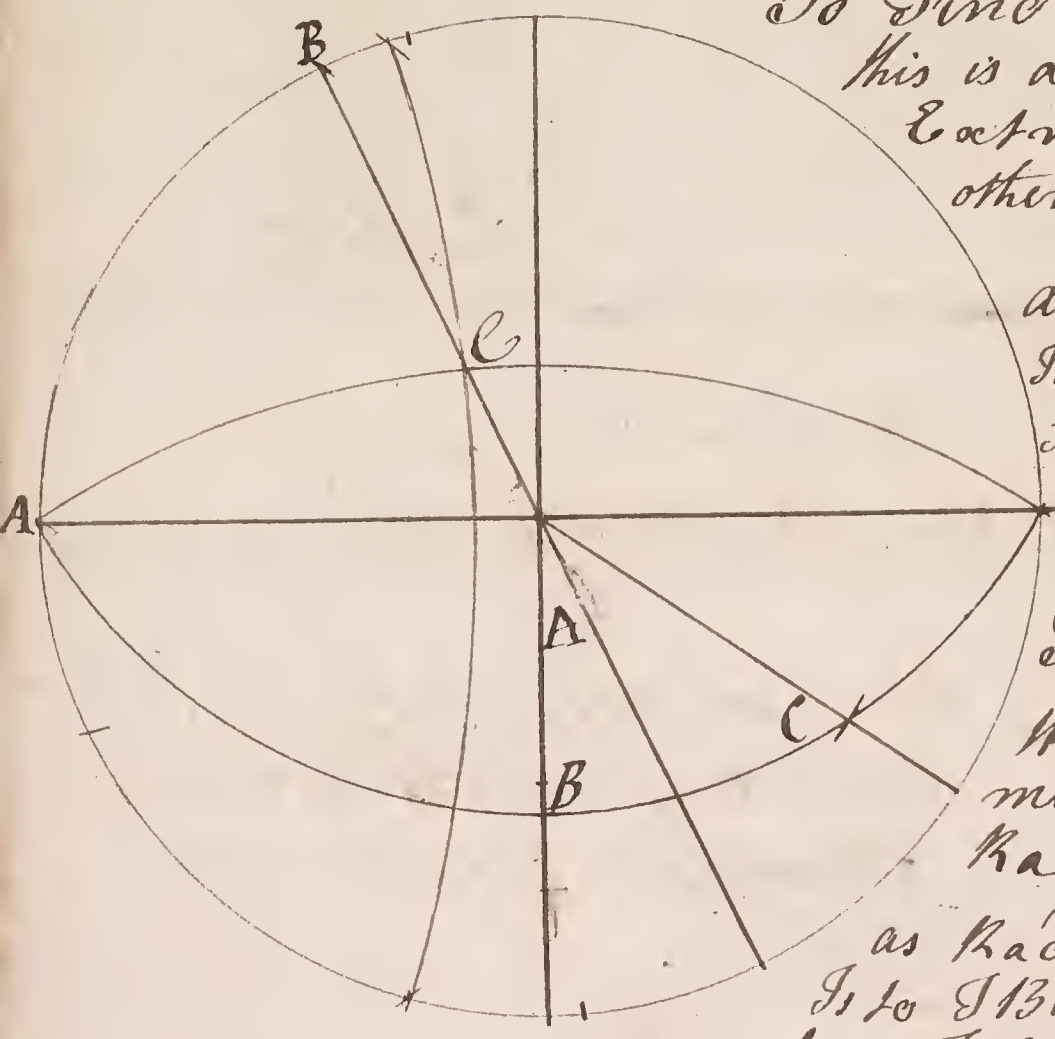
as S angle C	72 ° 15	9.9788817
Is to Radius	90 ° 00	10.
So is S Base ab	64 ° 20	9.9548463
To S Hypot ac	72 ° 09	9.9760666

To Find the angle C. A

This is a Disjunct term an Extreme is Required therefore the other Extreme must Lead ——

as S C Base ab	64 ° 20	9.9366823
Is to Radius	90 ° 00	10.
So is S C angle C	72 ° 15	9.9787107
To S angle A	44 ° 44	9.8473930

Case A } Base AB = 61° 20′ } To find the rest
Given } Hypotal = 72 : 35 }



To Find the angle C

This is a disjunct term and an Extreme is Req^d therefore the other Extreme must Lead.

as S Hypotal 72 ° 35 -- 9.979615
Is to Radius -- 90 ° 00 -10.
So is S Base AB 61 ° 20 - 9.943210
To S angle C - 66 ° 52 - 9.963595

To Find the angle A

This is an adjunct term the middle part Req^d therefore Radius must Lead.

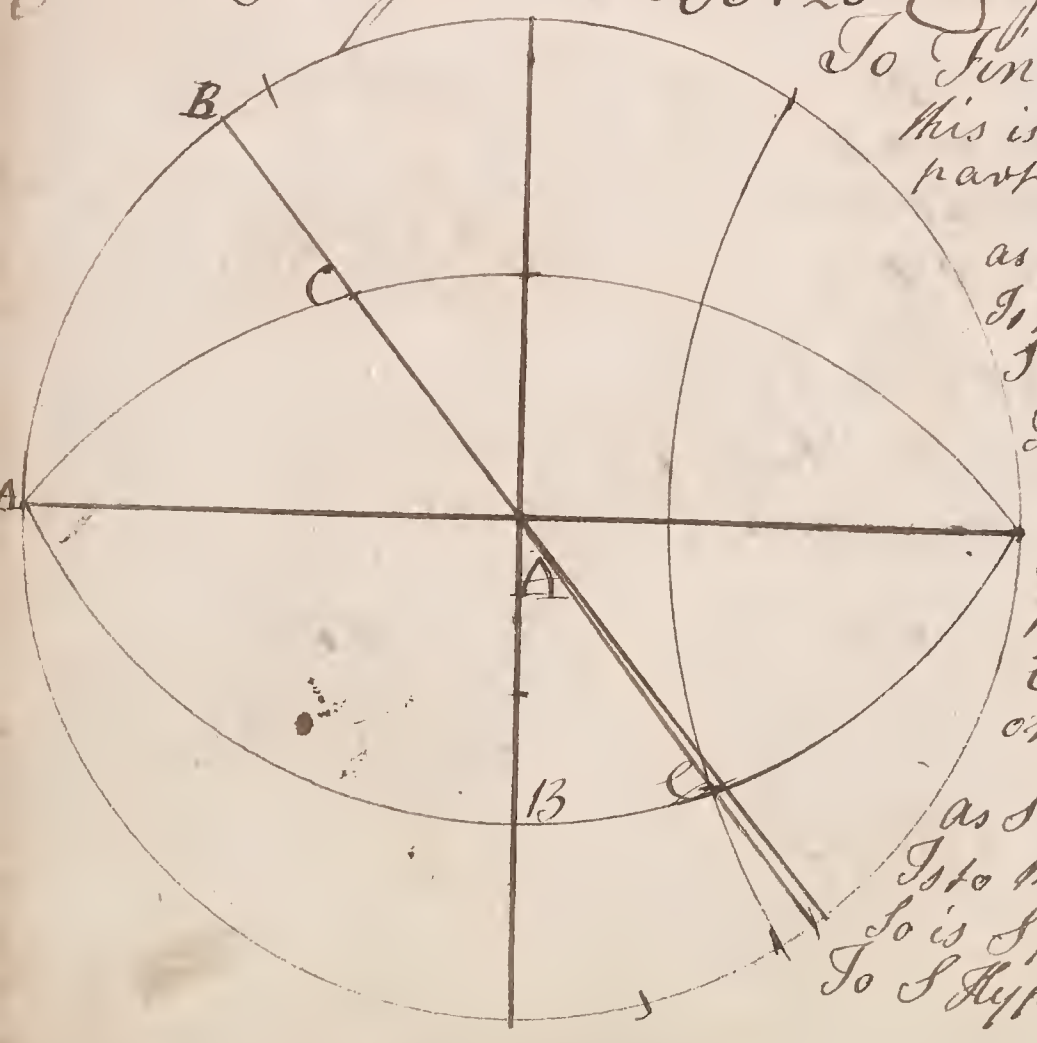
as Radius ..... 90 ° 00 --- 10
Is to S Base AB .... 61 ° 20 - - - 10.262229
So is S C Hypotal 72 ° 35 --- 9.496515
To S angle A ..... 54 ° 59 --- 9.758744

To Find the Perpendicular BC

This is a Disjunct term and an Extreme is Req^d therefore the other Extreme must Lead.

as S C Base AB ..... 61 ° 20 ..... 9.660952
Is to Radius ..... 90 ° 00 ..... 10.
So is S C Hypotal ..... 72 ° 35 ..... 9.976133
To S C per: BC ..... 51 ° 24 ..... 9.795151

Case 5 } Perp^r BC = 31 : 50 } To find the rest
Given } angle at a = 36 : 20 }



To Find the Base AB

This is an adjunct term the middle part Req^d therefore Radius must Lead

as Radius -- 90 ° 00 ---- 10
Is to Perp^r BC 31 ° 50 --- 9.792974
So is T angle a 36 ° 20 - 10.133436
To S Base AB 57 ° 35 - 9.926410

To Find the Hypot AC

This is a Disjunct term and an Extreme is Req^d therefore the other Extreme must Lead

as S angle a 36 ° 20 ---- 9.772675
Is to Radius -- 90 ° 00 -- 10
So is S perp^r BC 31 ° 50 ---- 9.722181
To S Hypot^l AC 62 ° 55 -- 9.949506

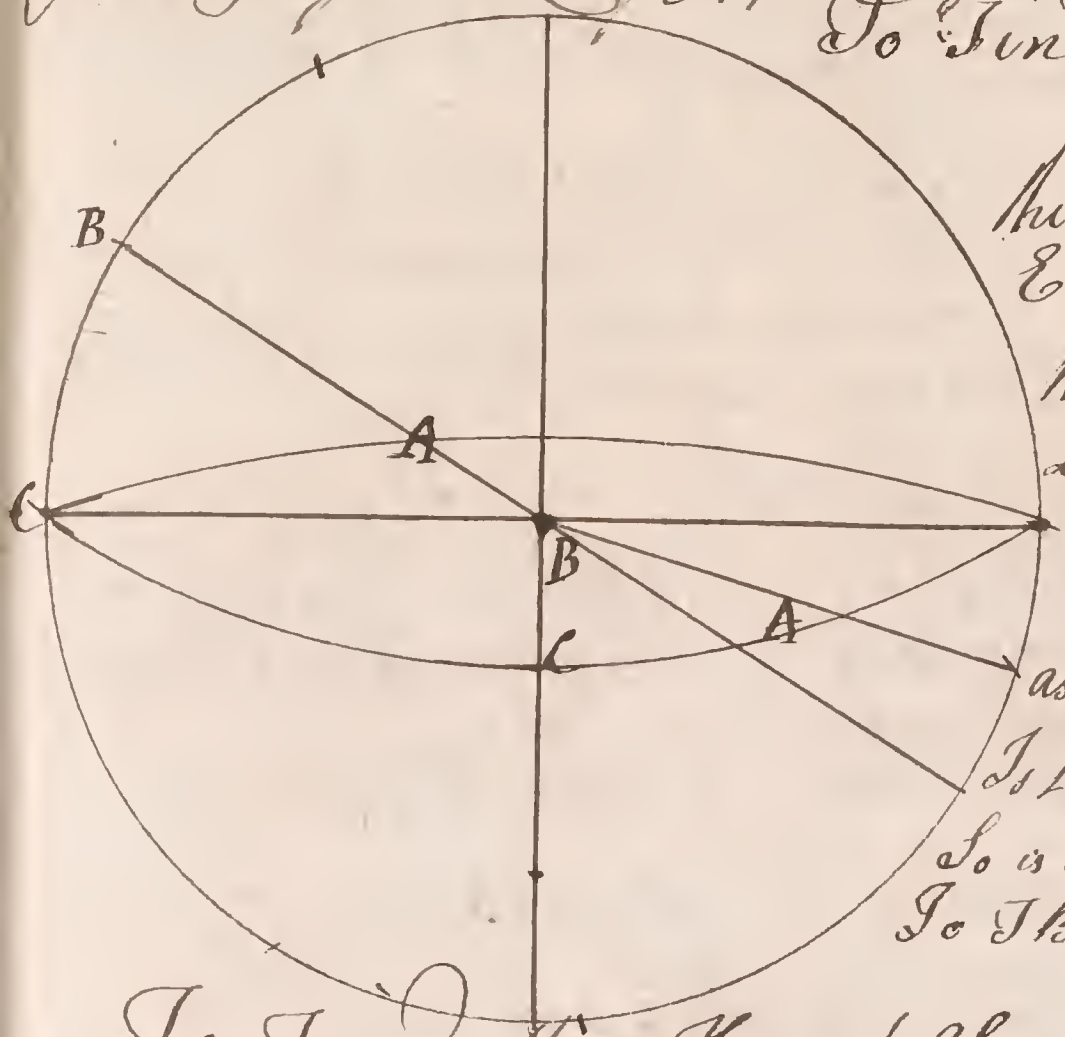
To Find the angle C

This is a Disjunct term and an Extreme is Required therefore the other Extrem must Lead

as S C per: B C	81°50	9.929207
Is to Radius	90°.00	10
So is S C angle a	36°20	9906111
To S angle C	71°29	9.976904

Case 6 } Per: B C = 32°:25 } To find the rest
Given } angle at C = 73°:10 }

To Find the Base ab



This is an adjunct term and an Extreme is Req.d therefore the other Extreme must Lead

as S C angle C	73°10	9.480801
Is to Radius	90°00	10
So is S per: B C	32°25	9.729223
To I Base ab	60°31	10.248422

To Find the Hypotal

This is a adjunct term and an Extreme is Req.d therefore the other Extreme must Lead

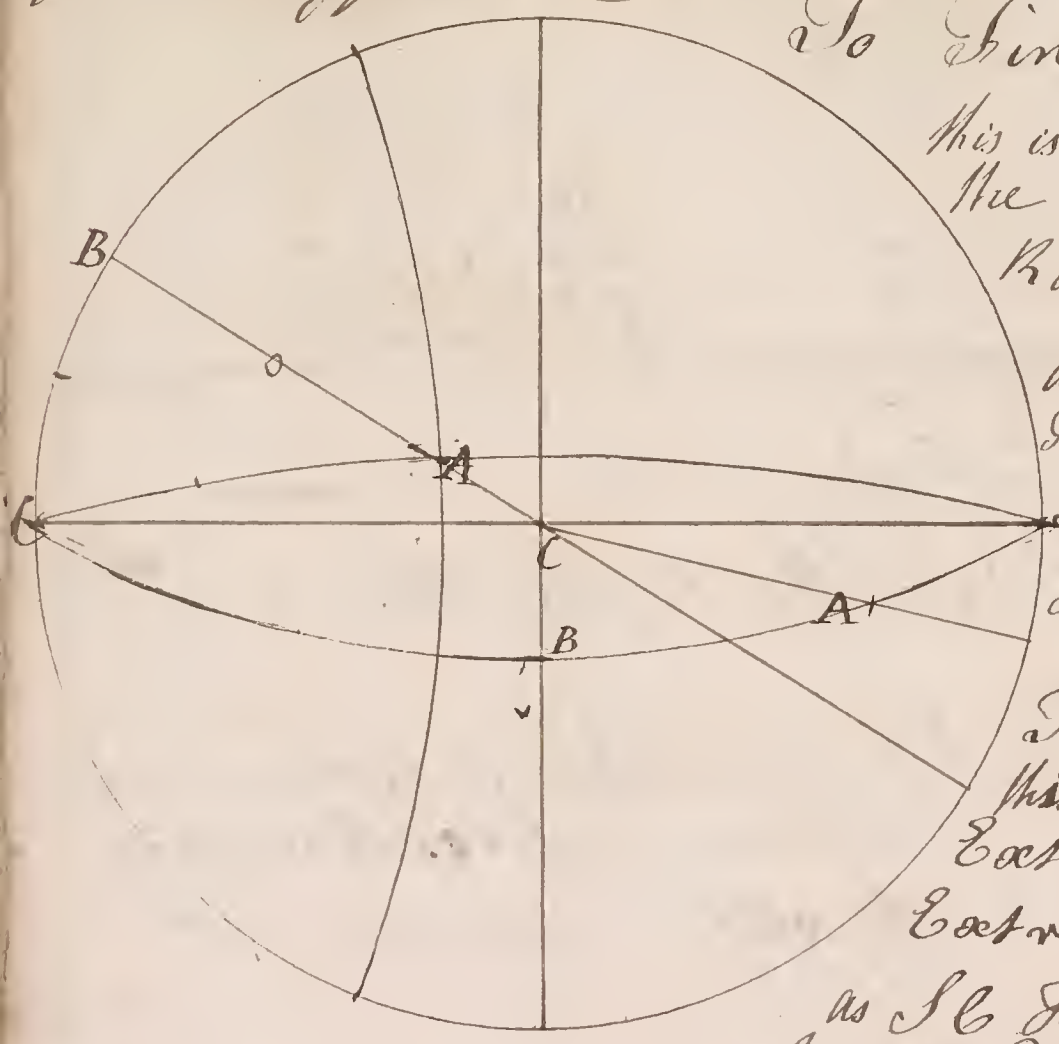
as I per: B C	32°25	9.702792
Is to Radius	90°00	10
So is S angle C	73°10	9.480762
To S C Hypotal	65°30	9.656990

To Find the angle A

This is a Disjunct term and the middle part Required therefore Radius must Lead

as Radius	90°00	10.
Is to S angle C	73°10	9.956090
So is S C per: B C	32°25	9926431
To S C angle a	36°06	9.907411

Case 7 } Perp. BC = 31 : 20 } To find the rest
Given } Hypot AC = 68 : 50 }



To Find the angle C

This is an adjunct term ~~and an~~ the middle part Req.d therefore Radius must Lead.

as Radius 90 : 00 ------ 10
Is to S C Hypot AC 68 : 50 - 9.968791
So is S Perp. BC 31 : 20 - 9.716479
To S C angle A 76 : 22 - 9.372420

To Find the angle A

This is a disjunct term and an Extreme is Req.d therefore the other Extreme must Lead.

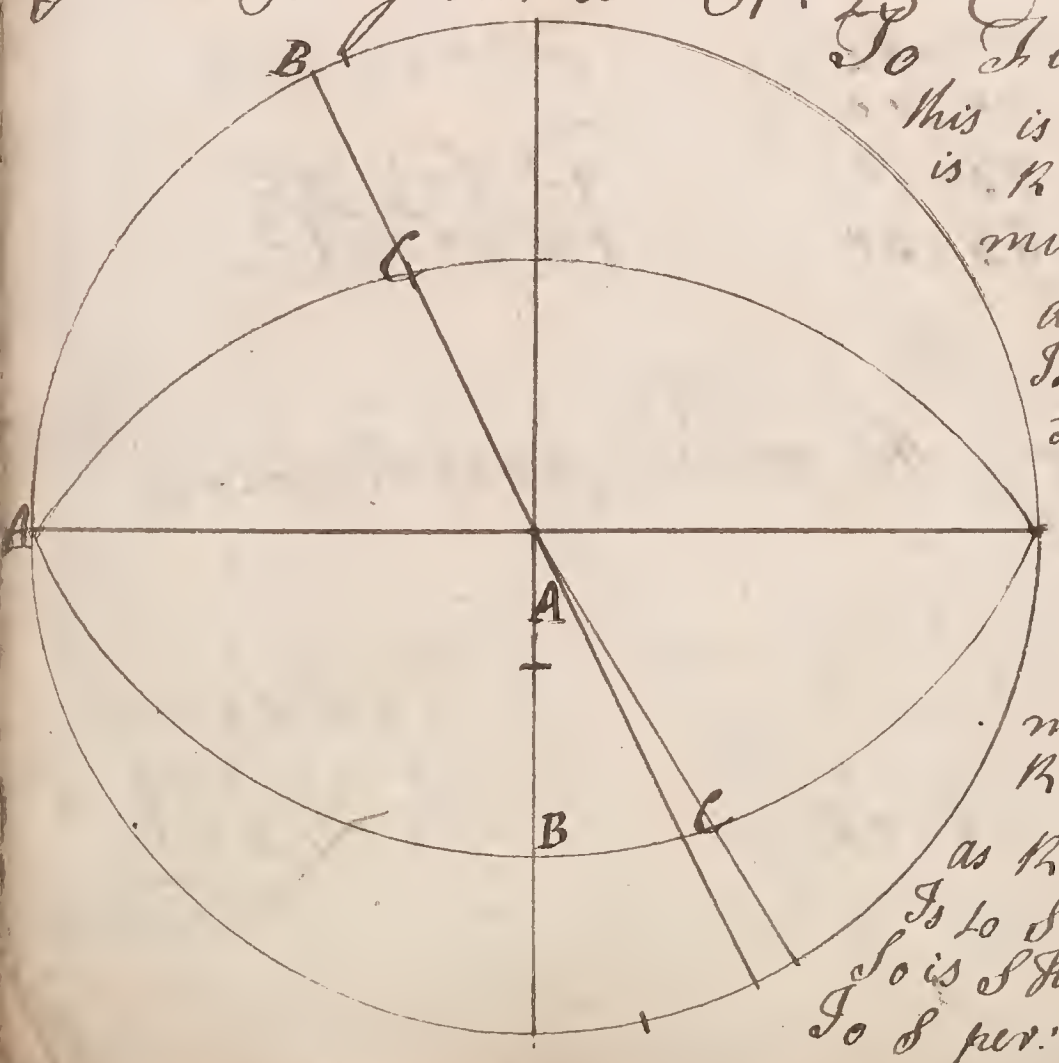
as S C Hypot AC -- 68 : 50 - 9.969665
Is to Radius ------ 90 : 00 - 10
So is S Perp. BC --- 31 : 20 - 9.716017
To S angle A ---- 33 : 45 - 9.746352

To Find the Base AB

This is a Disjunct term and an Extrem is Req.d therefore the other Extreme must Lead

as S C Perp. BC ------- 31 : 20 ---------- 9.931537
Is to Radius ---------- 90 : 00 ---------- 10.
So is S C Hypot AC ---- 68 : 50 ---------- 9.957661
To S C Base AB ------- 64 : 59 ---------- 9.826069

Case 8 } Hypot AC = 68 : 20 } To find the rest
Given } angle at A = 31 : 25 }



To Find the Base AB

This is an adjunct term and an Extreme is Req.d therefore the other Extreme must Lead

as S C Hypot AC 68 : 20 - 9.969291
Is to Radius - 90 : 00 - 10
So is S C angle A 31 : 25 - 9.931152
To S Base AB - 65 : 3 - 10.338061

To Find the Perp. BC

This is a Disjunct term and the middle part Req.d therefore Radius must Lead

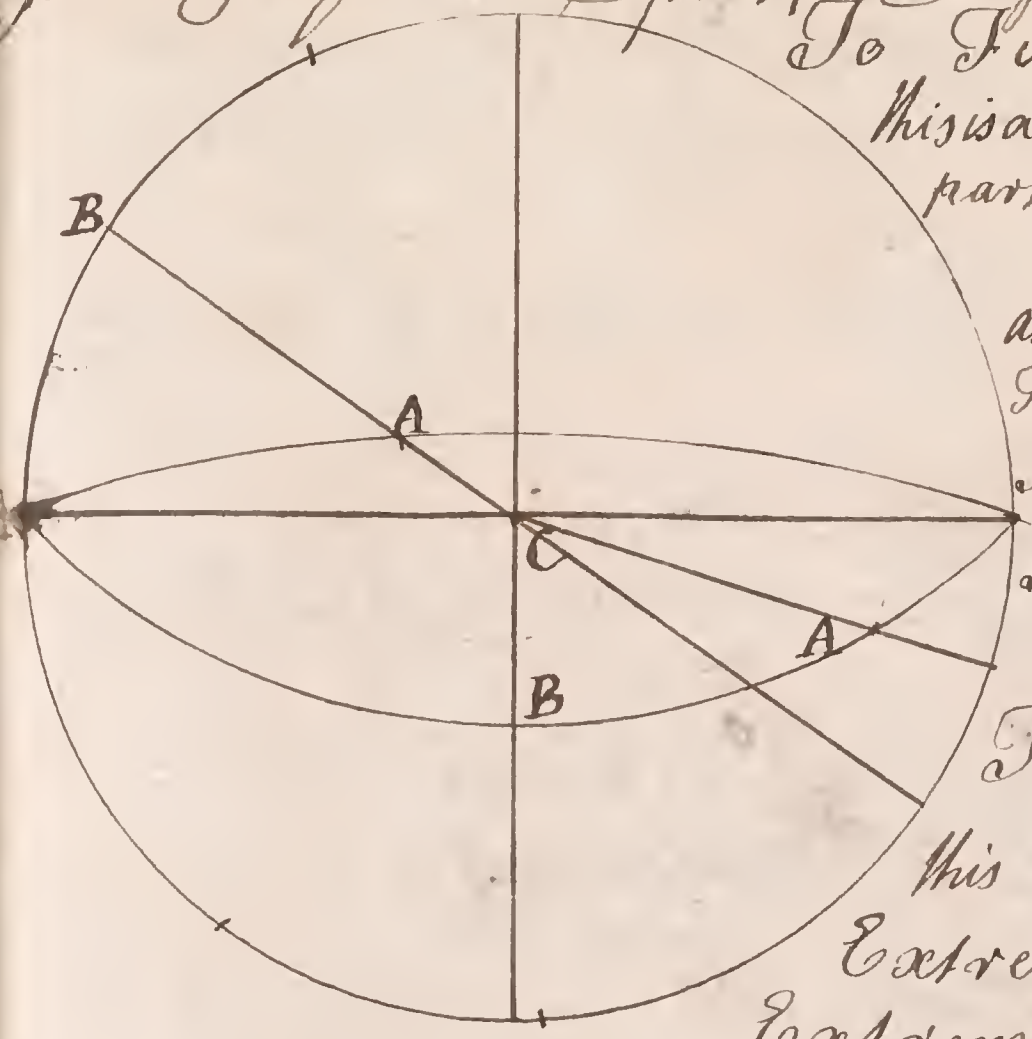
as Radius 90 : 00 ------ 10
Is to S angle A 31 : 25 - 9.717053
So is S Hypot AC 68 : 20 - 9.969017
To S Perp. BC - 28 : 5 - 9.655231

To find the ∠ angle C

This is a Disjunct term and an Extreme is Req.d therefore the other Extreme must Lead

as ∠ C angle a	31° 25	10.214100
So to Radius	90° 00	10.
So is S ∠ Hypot ac	66° 20	9.956729
To ∠ angle C	77° 17	9.956629

Case 9 } Hypot AC = 67° 15 } To find the rest
Given } angle at C = 72° 40 }



To Find Base AB

This is a Disjunct term and the middle part Req.d therefore Radius must Lead

as Radius	90° 00	10.
So to S Hypot AC	67° 15	9.964526
So is S angle C	72° 40	9.979816
To S Base AB	61° 41	9.944342

To Find the Per: BC

This is an adjunct term and an Extreme is Req.d therefore the other Extreme must Lead.

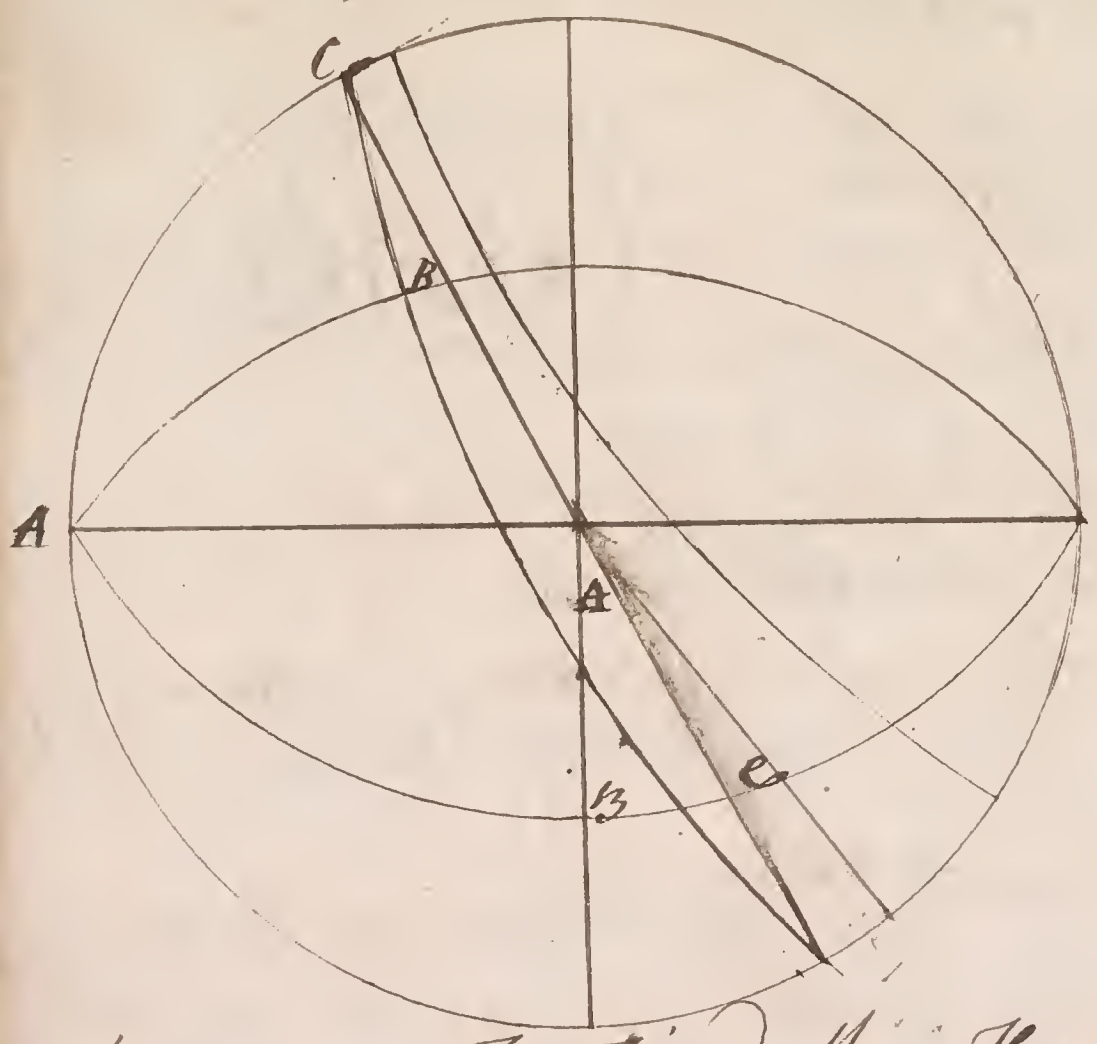
as ∠ Hypot AC	67° 15	9.622561
So to Radius	90° 00	10
So is S ∠ angle C	72° 40	9.474115
To S per: BC	35° 24	9.851554

To Find the angle A

This is an adjunct term and an Extreme is Req.d therefore the other Extreme must Lead

as ∠ C angle C	72° 40	9.494299
So to Radius	90° 00	10
So is S ∠ Hypot AC	67° 15	9.587386
To ∠ angle A	32° 40	10.193087

Case 10 { Angle at a = 36° 45′ } { To find the rest
Given { Angle at C = 71 : 50 }



To find the Hypot ac

This is an adjunct term and an Extreme is Req? therefore the other Extreme must Lead

as Radius	90 ° 00	10
Is to S Angle C	71 ° 50	9.516057
So is S Angle a	36 ° 45	10.126833
To S C Hypot ac	63 ° 56	9.642890

To find the Base ab

This is a Disjunct term and an Extrem is Req? therefore the other Extreme must Lead. ——

as S angle a	36 ° 45	9.776937
Is to Radius	90 ° 00	10.
So is S C angle C	71 ° 50	9.949851
To S C Base ab	56 ° 36	9.716914

To find the Per: BC

This is a Disjunct term and an Extreme is Req? therefore the other Extreme must Lead

as S angle C	71 ° 50	9.977794
Is to Radius	90 ° 00	10.
So is S C angle a	36 ° 45	9.903770
To S C per: BC	32 ° 31	9.925976

Oblique angled Spherical Trigonometry

Oblique angled Sherical Triangles are solved by Dividing them into two right angled Sherical Triangles; which is to be done by letting fall a perpendicular from the end of a given Side, and oppisite to a given angle.

When three sides are given Say as the Tangent of ½ the Base Is to the Tangent of ½ the Sum of the other two sides: So is the Tangent of ½ their Difference to the Tangent of ½ the Difference of the Segments of the Base.

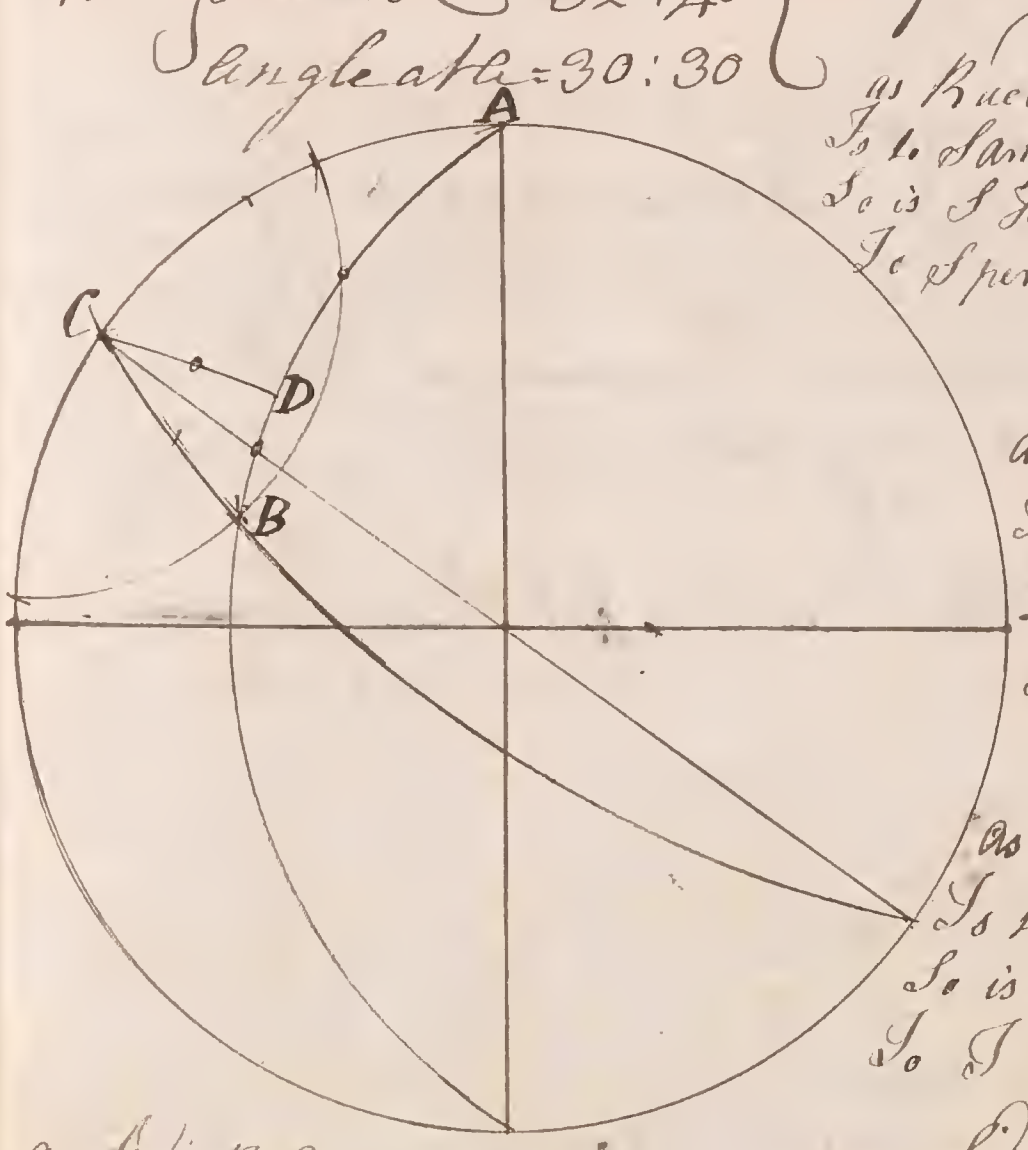
When the three angles are given they must be Considered as 3 Sides

---

Case 1 Given } Two Sides & an angle oppovite to one of them

Viz^l } Side aC = 53°:15'
Side BC = 32°:40'
angle at a = 30:30

} To find the rest



as Radius ------ 90.00 ------ 10.
Is to Sangle a ---- 30.30 ------ 9.705469
So is S Hypot aC -- 53.15 ------ 9.903770
To S per: CD --- 24.00 ------ 9.609239

as S C per: CD 24.00 -- 9.960730
Is to Radius 90.00 -- 10.
So is S C BC 32.40 -- 9.925222
To S C Base BD 22.52 -- 9.964492

as T C Hypot aC 53.15 -- 9.873167
Is to Radius ---- 90.00 -- 10.
So is Sangle a --- 30.30 -- 9.935320
To T Base aD ------ 19.05 -- 10.062153
22.52
71.57

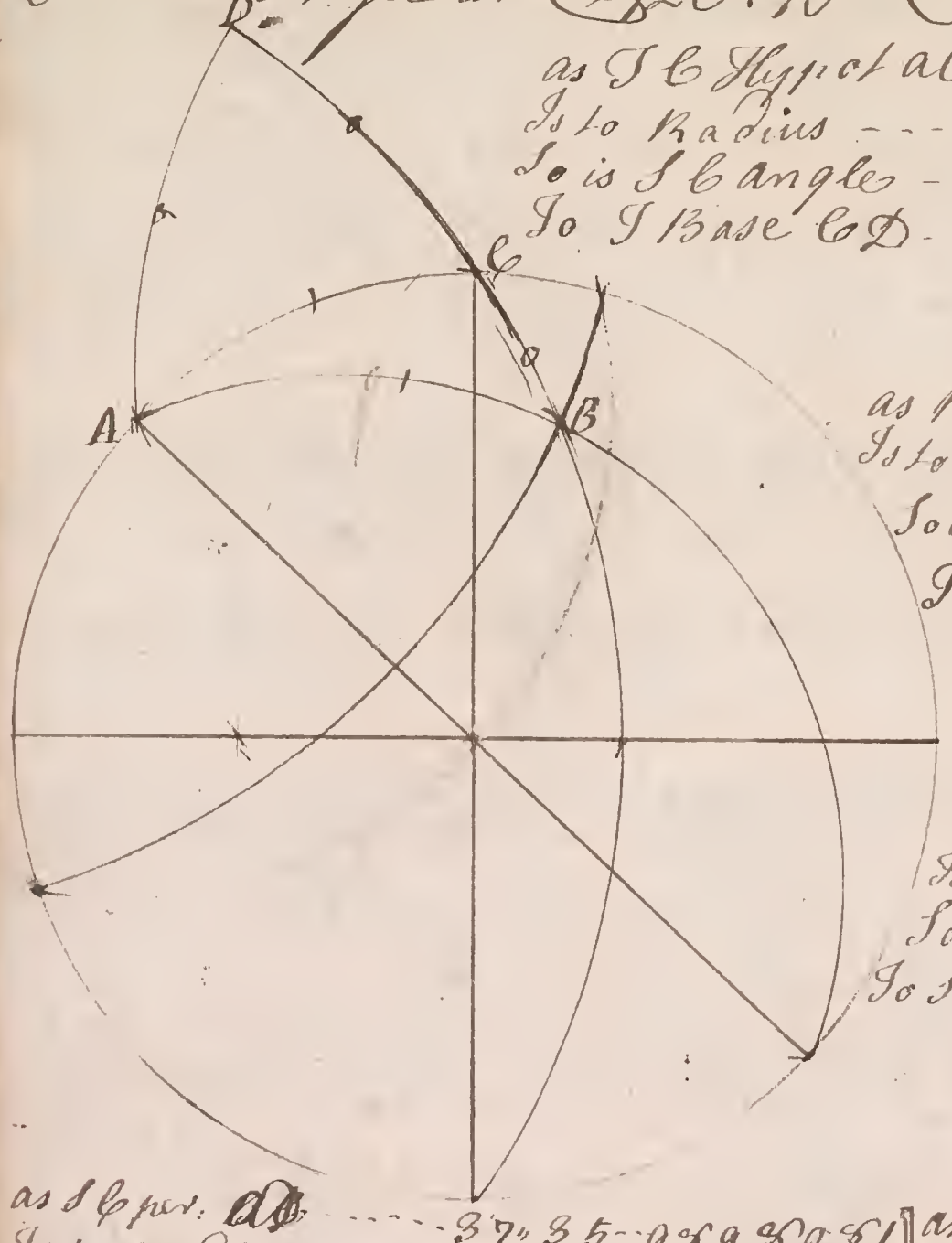
as Side BC --- 32.40 --- 9.732193
Is to Radius ---- 90.00 -- 10.
So is Side CD --- 24.00 -- 9.609313
To Sine angle B 46.53 -- 9.877120

as Side BC ------ 32.40 --- 9.732193
Is to Sine angle a -- 30.30 -- 9.705469
So is Side aB ----- 71.57 -- 9.977063
To Sine angle C -- 63.23 -- 9.963552
9.951359

Ex. Given { Base AB = 62° 45′ ; Side AC = 46 : 50 ; angle at C = 123 : 15 } To find the rest

30 : 18
54 : 43
24 : 25

as S C Hypot AC -- 46 : 50 -- 9.972 1866
Is to Radius ------ 90 : 00 -- 10.
So is S C angle ---- 56 : 45 -- 9.739 013
To S Base CD --- 30 : 18 -- 9.766 825



as Radius --- 90 : 00 ---- 10.
Is to Side AC --- 46 : 50 -- 9.866 294
So is Sine angle C 56 : 45 -- 9.922 365
To Side AD --- 37 : 35 -- 9.788 659

as Side AB ------ 62 : 45 = 9.946 910
Is to Sine angle C 56 : 29 -- 9.922 660
So is Side AC --- 46 : 50 -- 9.866 294
To Sine angle B --- 43 : 22 -- 9.788 256
9.836 718

as S C per: AD ------ 37 : 35 -- 9.789 851
Is to Radius ------ 90 : 00 -- 10
So is S C Hypot AC - 62 : 45 -- 9.960 746
To S C Base BD - 54 : 43 -- 9.761 765

as Side AD ---- 37 : 35 -- 9.788 269
Is to Sine angle B 43 : 22 -- 9.836 725
So is Side BD --- 54 : 43 -- 9.911 853
To S angle A -- 66 : 17 -- 9.963 792
9.963 792

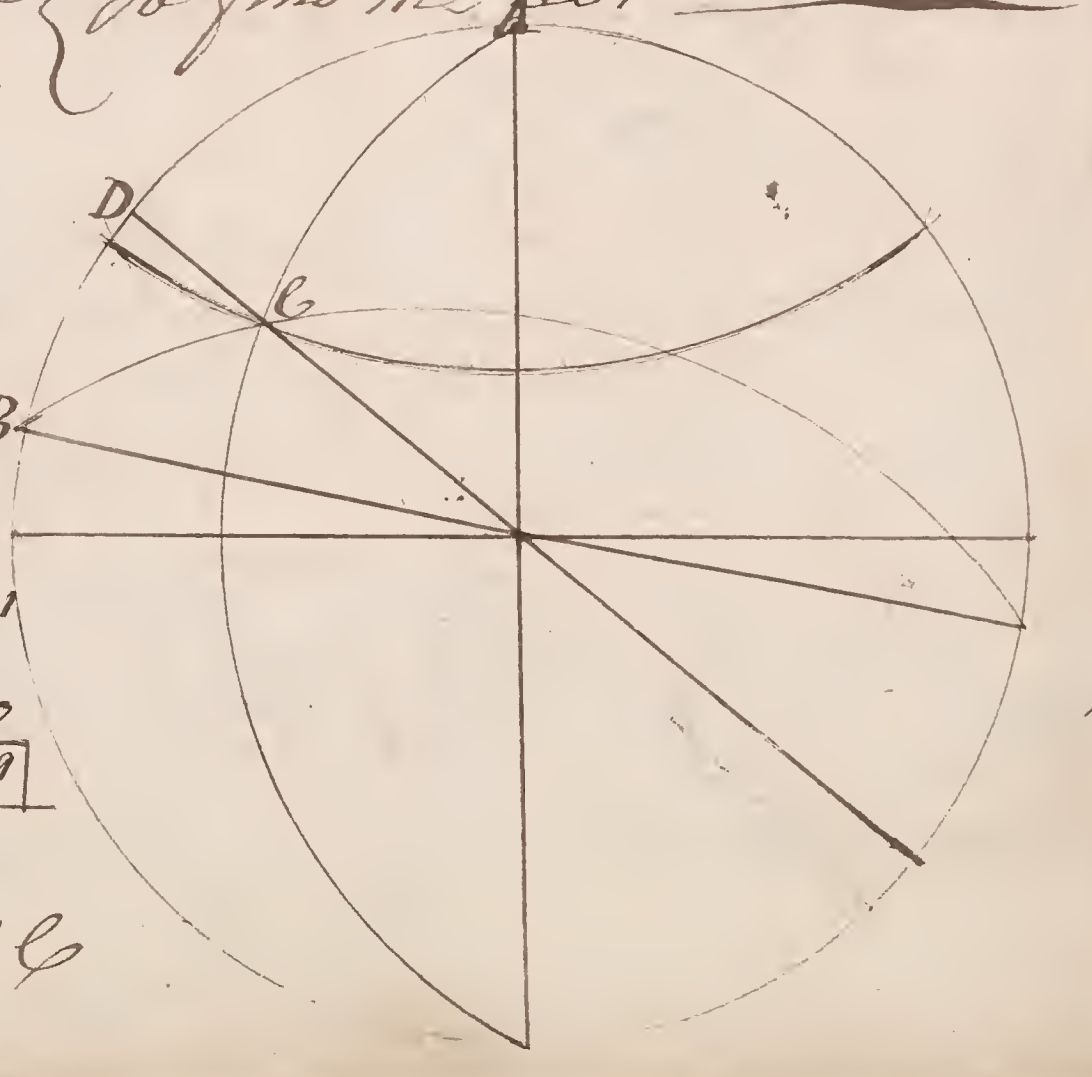
Case 2 Given { Two angles and a Side opposite to one of them

Viz { Angle a = 31° 20′ ; Angle B = 46 : 15 ; Side AC = 53 : 50 } To find the rest

as Radius --- 90 : 00 --- 10
Is to S Hypot AC 53 : 50 -- 9.907 037
So is S angle A 31 : 20 -- 9.716 017
To S per: BC 24 : 50 -- 9.623 054

as S angle B 46 : 15 -- 9.856 756
Is to Side AC 53 : 50 -- 9.907 037
So is S angle A 31 : 20 -- 9.716 017
To Side BC 35 : 33 -- 9.623 054
9.764 296

as S C Hypot BC 35 : 33 -- 10.145 931
Is to Radius -- 90 : 00 -- 10
So is S C angle B 46 : 15 = 9.856 800
To S per: BD 26 : 16 = 9.693 669

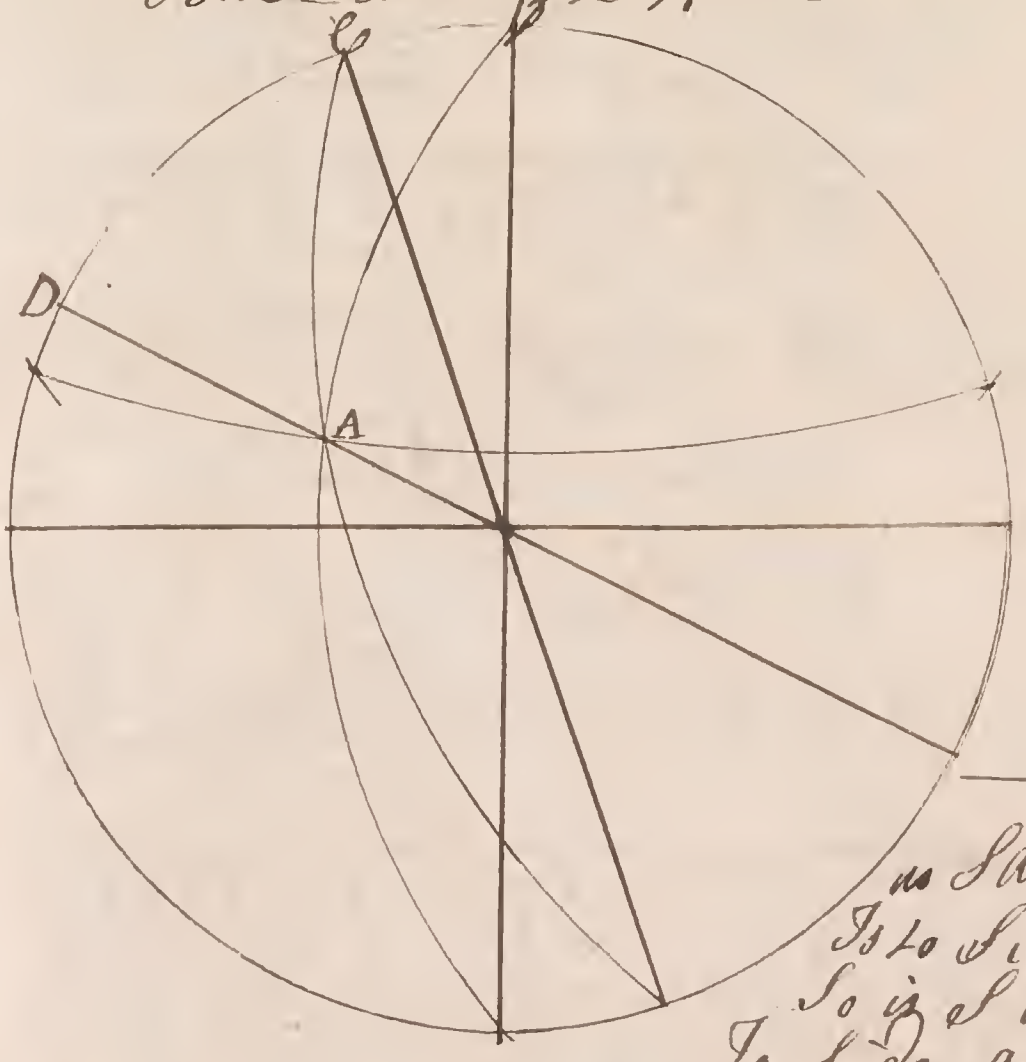


AB: 75 : 44 ; 180 : 00 ; 60 : 06 ; 119 : 54 C

as S C Hypot ab	53° 60	9.663915
Is to Radius	90° 00	10.
So is S C angle a	31° 20	9.931537
To I Base aD	49° 26	10.067622

as Side BC	35° 33	9.764473
Is to S angle A	31° 20	9.716017
So is Side aB	75° 44	9.966396
To Sine angle C	86° 19	9.702412
		9.937939

Do { angle B = 48° 50 / angle C = 123° 15 / Base aB = 72° 40 } Given. To find the rest



180° 00
123° 15
56° 45 ∠ C

64° 35
42° 39
21° 56 ∠ B C.

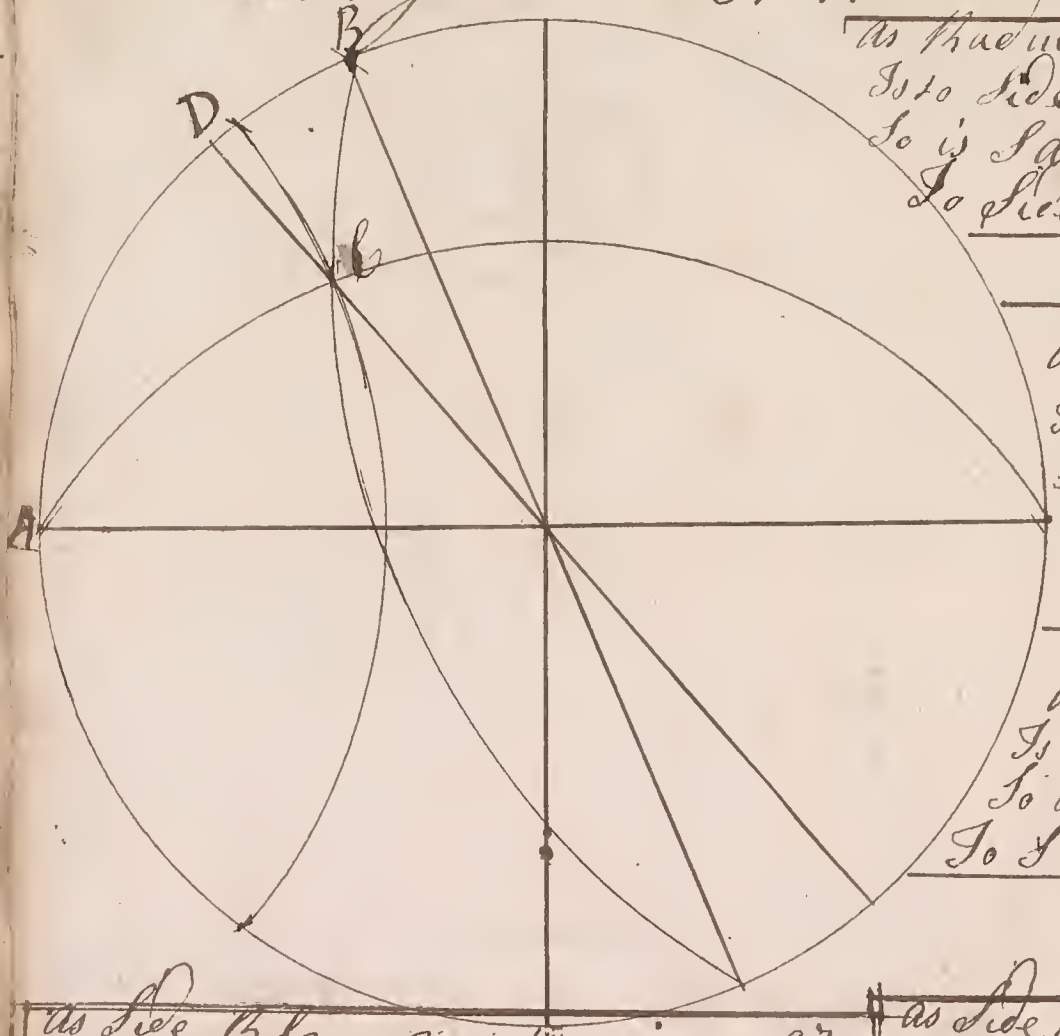
as S angle C	56° 45	9.922355
Is to Side aB	72° 40	9.979416
So is S angle B	48° 50	9.871678
To Side aC	59° 14	19.856494
		9.934134

as I C Hypot aC	59° 14	9.774759
Is to Radius	90° 00	10.
So is S C angle B	56° 45	9.739013
To I Base C D	42° 39	9.964254

as I C Hypot aB	72° 40	9.949299
Is to Radius	90° 00	10.
So is S C angle B	48° 50	9.871392
To I Base B D	64° 36	10.321093

as Side aB	72° 40	9.979416
Is to S angle C	56° 45	9.922355
So is Side B C	21° 59	9.573263
To Sine angle A	19° 06	19.495616
		9.515602

Case 3. Given { Two Sides and their contained angle
Viz { Base AB = 67° 30'
Side AC = 52° 15'
Angle at A = 31° 45' } To find the rest



As Radius	90° 00'	10.
Is to Side AC	52° 15'	9.899006
So is Sine Angle A	31° 45'	9.721162
To Side DC	24° 35'	9.620166

As Sine Hypot AC	52° 15'	9.899006
Is to Radius	90° 00'	10
So is Sine Angle A	31° 45'	9.929599
To Sine AB	46° 06'	10.040699

AB 67° 30'
BD 19° 24'

As Radius	90° 0'	10.
Is to Sine Base	19° 24'	9.971614
So is Sine perp. DC	24° 35'	9.957934
To Sine Hypot BC	30° 56'	9.933348

As Side BC	30° 56'	9.710997
Is to Sine Angle A	31° 45'	9.721162
So is Side AC	52° 15'	9.899006
To Sine Angle B	54° 02'	19.619166
		9.909171

As Side BC	30° 56'	9.910997
Is to Sine Angle A	31° 45'	9.721162
So is Side AB	67° 30'	9.965615
To Sine Angle C	71° 02'	19.686777
	180° 00'	9.975760

AC 56° 15'

D: Given { Side AC = 56° 15'
Side BC = 33° 45'
Angle C = 123° 45' } To find the rest

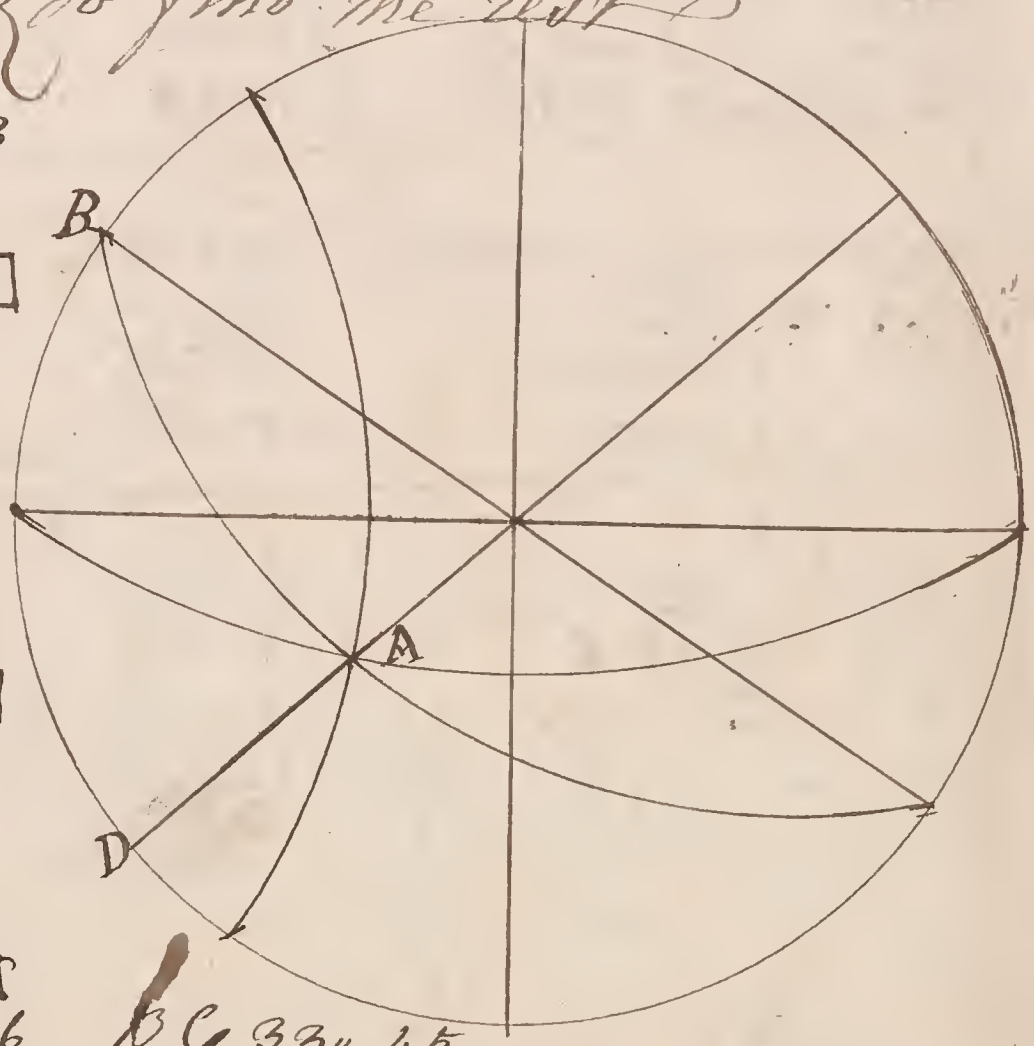
As Sine Hypot AC	56° 15'	9.919646
Is to Radius	90° 00'	10.
So is Sine Angle C	56° 15'	9.744739
To Sine Base CD	39° 45'	9.919646

As Radius	90° 00'	10.
Is to Side AC	56° 15'	9.919646
So is Sine Angle C	56° 15'	9.919646
To Side AD	43° 44'	9.839692

As Radius	90° 00'	10.
Is to Sine perp. AD	43° 44'	9.845577
So is Sine Base BD	73° 30'	9.953542
To Sine Hypot AB	76° 09'	9.912219

As Side AB	76° 9'	9.990644
Is to Sine Angle C	56° 15'	9.919646
So is Side AC	56° 15'	9.919646
To Sine Angle B	44° 57'	19.839692
		9.845490

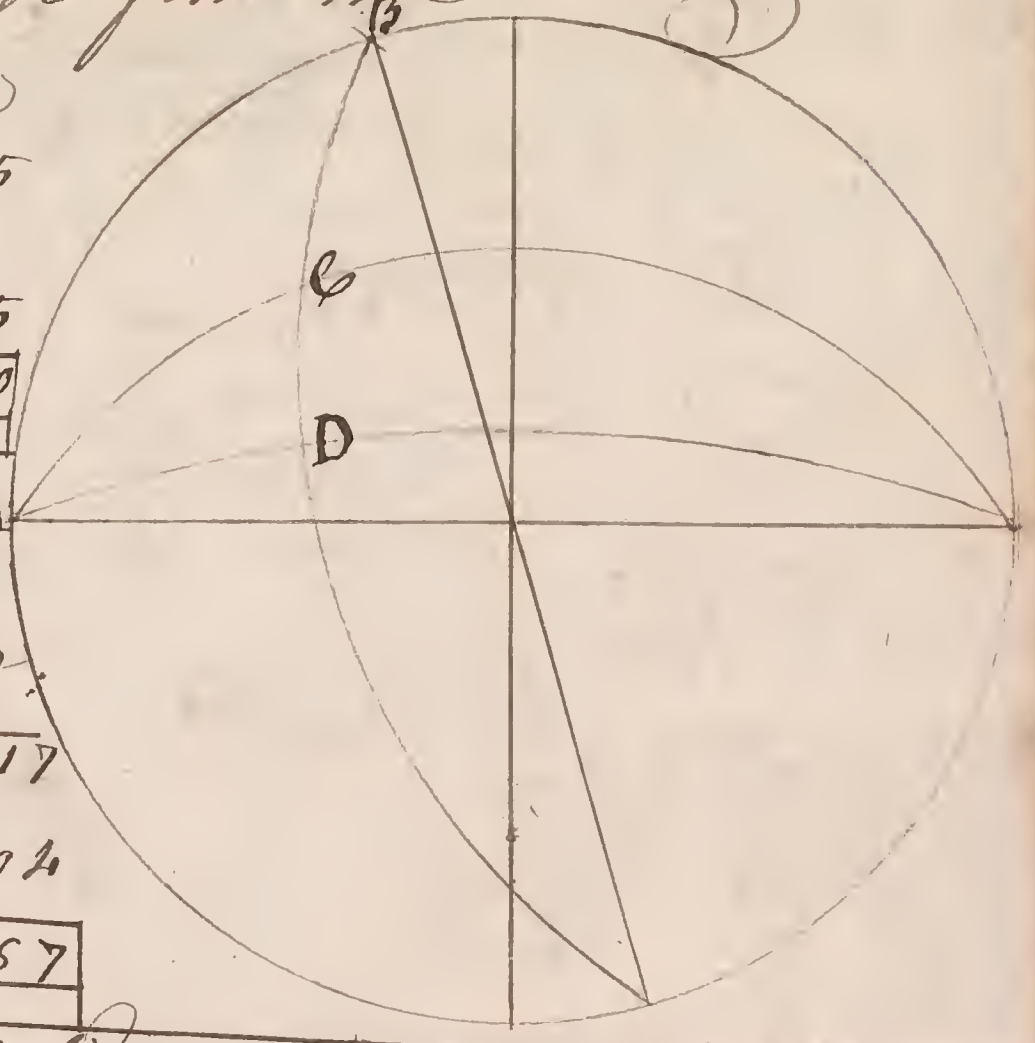
As Side AC	56° 15'	9.919646
Is to Sine Angle B	44° 57'	9.845490
So is Side BC	33° 45'	9.744739
To Sine Angle A	28° 10'	19.593777
		9.673941



BC 33° 45'
CD 39° 45'
BD 73° 30'

Case A Given } Two angles and their contained Side

Viz^t } angle a = 31° 25′
angle B = 48° 15′
Base ab = 72° 40′
} To find the rest



as Tc angle A -- 48° 15 -- 9.9 50625
Is to Radius --- 90° 00 -10.
So is Sc Hypot ab 72° 40 -9 47 4115
So Tc ∠ BAD -- 71° 33 -9.52 34 90

as Radius ---- 90° 00 -- 10
Is to Side ab -72° 40 -- 9979 516 A
So is Sangle A 48° 15 -9.67 2772
So Side AD 45° 25 -9.65 25 66

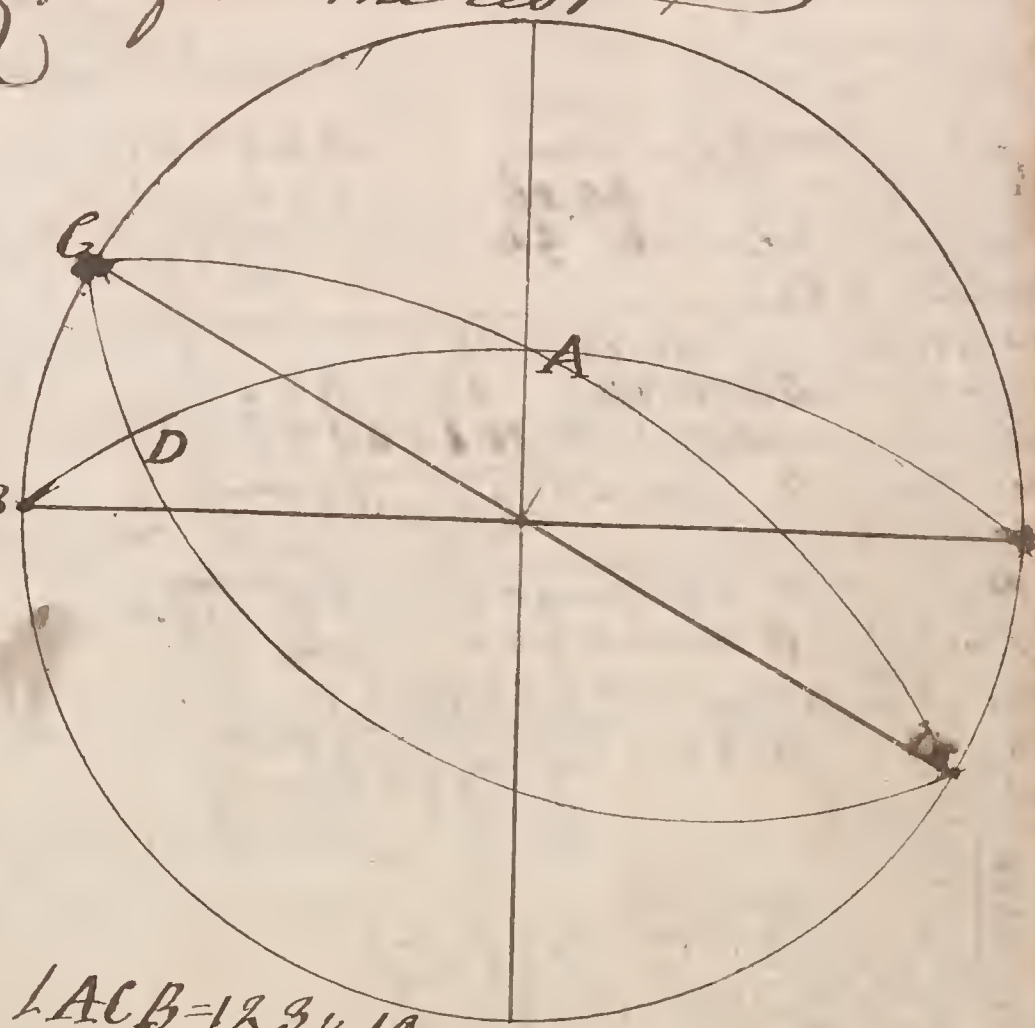
as Tper: AD -- 45° 25 -- 10.00 6317
Is to Radius --- 90° 00 -- 10.
So is Sc angle A 40° 06 -9.66 34 04
So Tc Hypot ab 53° 00 -- 9.67 70 67

as Sangle B -- 48° 15 - 9.67 2772
Is to Side ab - 53° 00 - 9.9 02 349
So is Sangle A 31° 25 9.71 70 53
So Side Bc - 33° 03 -9.61 94 02
9.73 66 30

as Side Bc --- 33° 03 --- 9.73 66 30
Is to Sangle A - 31° 25 - -9 71 70 53
So is Side AB - 72° 40 - 9.9 79 516
So Sangle C - 65° 51 -9.69 66 69
9.96 02 30

BD 71° 33
∠A 31° 25
∠C 40° 06
65° 51
∠C 60° 00
∠A 91° 69

D.o } angle B = 51° 20
Given } angle C = 123° 10
Side BC = 29 : 45
} To find the rest



as Radius ---- 90° 00 -- 10
Is to Side Bc - 29° 16 -- 9.69 56 71
So is Sangle B - 51° 20 -9.66 93 041
So Side CD - 22° 60 9.56 67 12

as Tc angle B ---- 51° 20 - 9.90 31 97
Is to Radius --- 90° 00 - 10.
So is Sc Hypot BC 29° 45 -9.9 36 619
So Tc angle C -- 42° 40 - 10.03 54 22

as Tper: ∠ D -- 22° 50 - 9.62 44 330
Is to Radius --- 90° 00 - 10.
So is Sc angle C 60° 30 9.21 76 09
So Tc Hypotal 66° 36 - 9.59 32 79

as Sangle B -- 51° 20 --- 9.66 93 041
Is to Side ac -- 66° 36 --- 9.9 66 976
So is Sangle C 66° 50 -- 9.9 22 76 66
So Side AB -- 65° 35 - 19.66 91 74 44
9 9 9 67 03

as Sal ---- 66° 36 - 9.9 66 976
Is to Sangle B - 51° 20 - 9.66 93 041
So is Side Bc - 29° 45 - 9.6 95 671
So Sangle A - 24° 37 - 19.56 87 12
9.6 19 736

∠ACB = 123° 10
∠BCD = 42° 40
∠ACD = 60° 30

1

Case 5 Given } The 3 Sides Viz^{t} { Base ab = 67° : 30′ / Side aC = 56 : 15 / Side BC = 32 : 40 } To find the Angles

As ½ Sof^{s} the Base ..... 33 : 45 .. 9.742893
So is ½ Sof^{s} of Sum of y^{e} other 2 Sides 44 : 27 . 9.991662
So is the Sof^{s} their Diff^{ce} .. 11 : 47 . 9.319329
To the Sof^{s} of y^{e} Diff^{ce} of y^{e} Sof^{s} Base 17 : 02 . 9.819991
9.454609

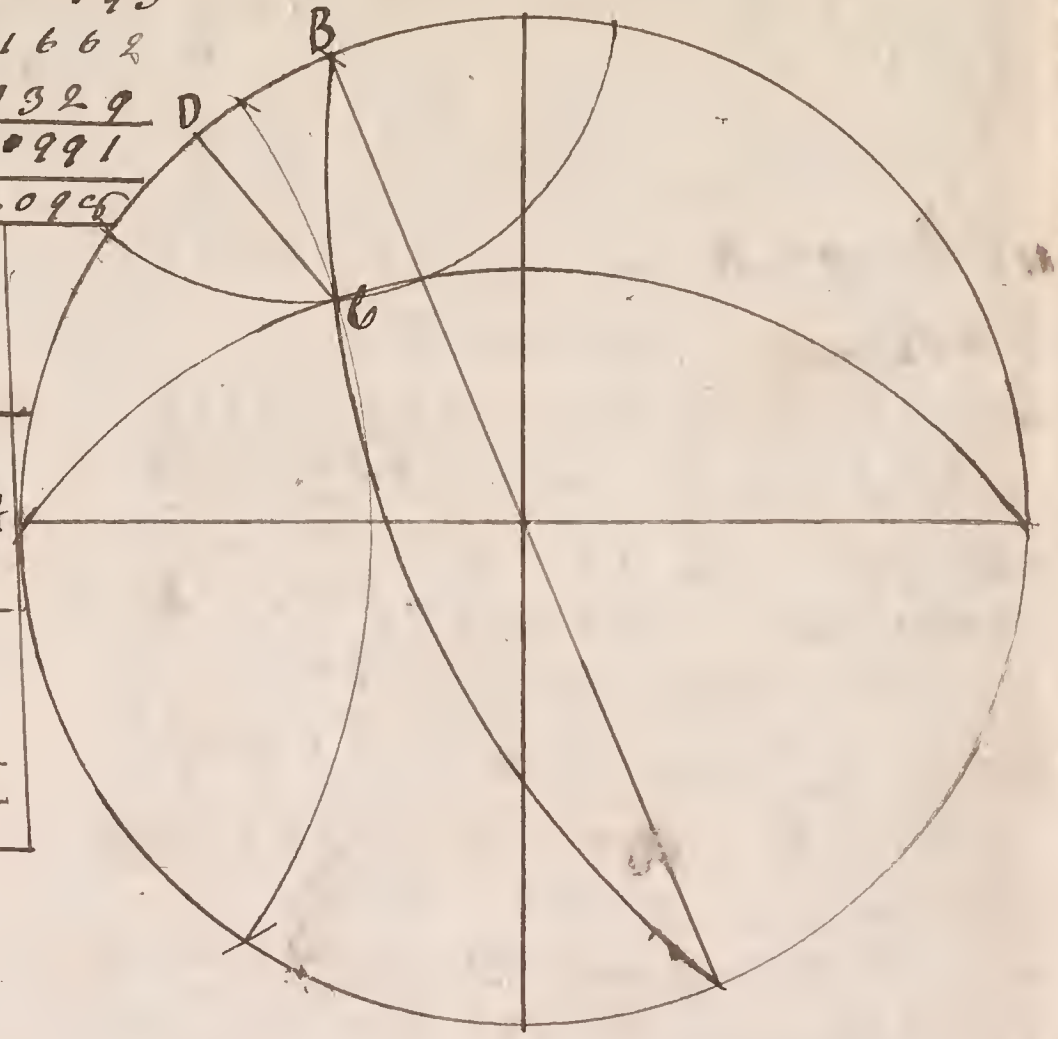
As Radius ... 90 : 00 .. 10
So is ½ Hypot aC 56 : 15 .. 9.742893
So is ½ Base aD 50 : 47 . 10.088276
To ∠ angle A 35 : 02 . 9.913169

as Radius ... 90 : 00 .. 10
So is ½ Hypot BC 32 : 40 .. 10.119029
So is ½ Base BD .. 16 : 43 . 9.477601
To ∠ angle a ... 62 : 04 . 9.670630

as Side BC ... 32 : 40 .. 9.732193
So is ∠ angle a . 35 : 02 . 9.758952
So is Side ab . 67 : 30 . 9.965615
To ∠ angle C . 79 : 06 . 19.724567
9.992374

½ Sof^{s} 67 : 30
½ aC 56 : 15
½ BC 32 : 40
½ Sof^{s} 98 : 55
Diff^{ce} 44 : 27
½ 23 : 35
11 : 47

33 : 45
17 : 02
aD 50 : 47
BD 16 : 43



Case 6 Given } The 3 angles Viz^{t} { angle a = 34° : 15′ / angle B = 48 : 20 / angle C = 121 : 50 } To find y^{e} Sides

As Sof^{s} the Base ..... 29 : 05 ... 9.742540
So is y^{e} Sof^{s} of Sum of y^{e} other 2 Sides 41 : 17 ... 9.943496
So is y^{e} Sof^{s} their ∝ ..... 7 : 02 ... 9.091226
To y^{e} Sof^{s} of y^{e} ∝ of y^{e} Seg^{t} of y^{e} Base 11 : 01 ... 19.034726
9.256496

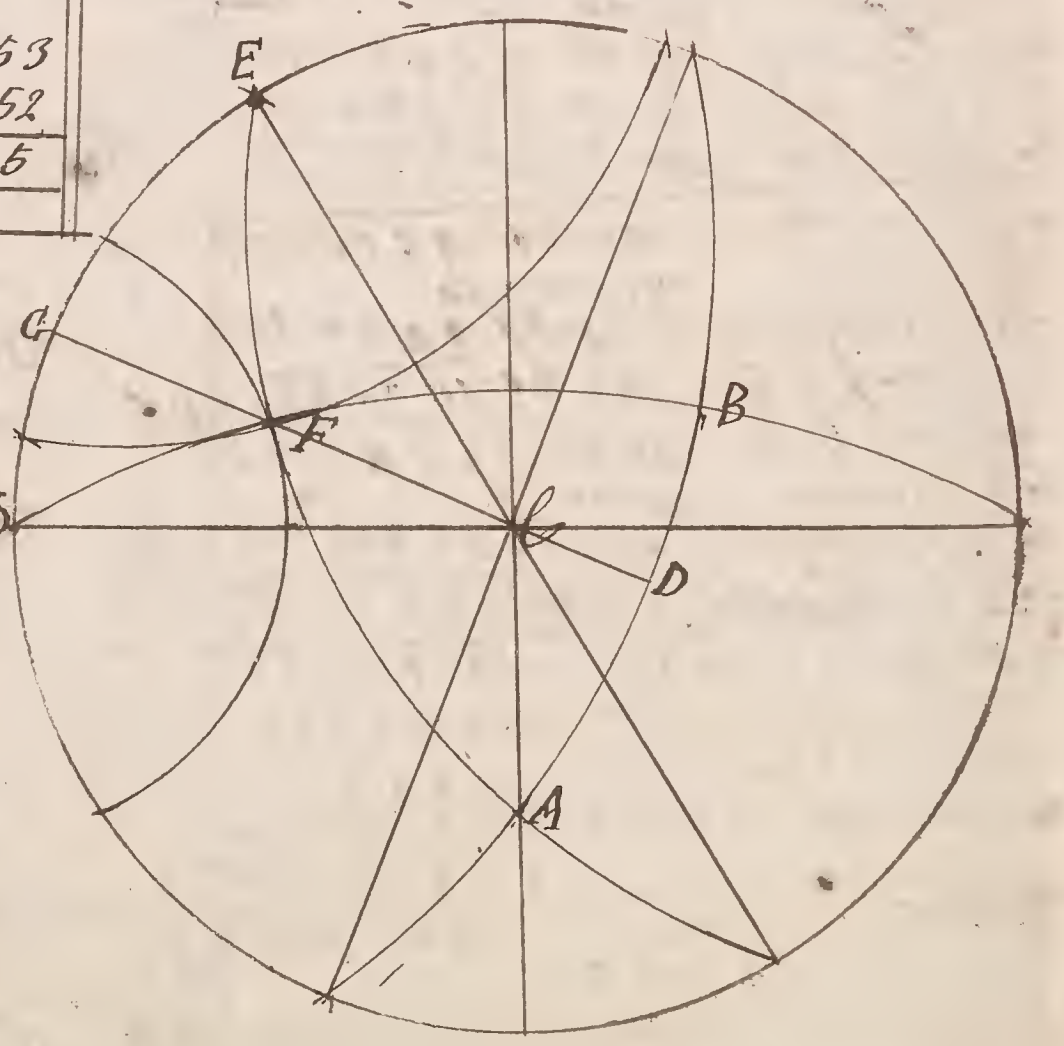
As Radius ..... 90 : 00 10
So is ½ C Hypot FC 46 : 20 ..... 9.949353
So is ½ Base ... 40 : 06 ..... 9.925852
To ∠ angle C ... 61 : 32 ... 9.967405
or Side BC

as Radius ..... 90 : 00 10
So is ½ Base DG 16 : 04 ... 9.513493
So is ∠ C Hypot DE 34 : 15 . 10.169932
To ∠ angle D ... 61 : 22 . 9.656025
or Side aC

As Side FE .. 46 : 20 .. 9.673335
So is ∠ angle D .. 61 : 22 . 9.943506
So is Side DE .. 56 : 10 . 9.929207
To ∠ angle D . 61 : 34 . 9.672555
or Side AB 9.999220

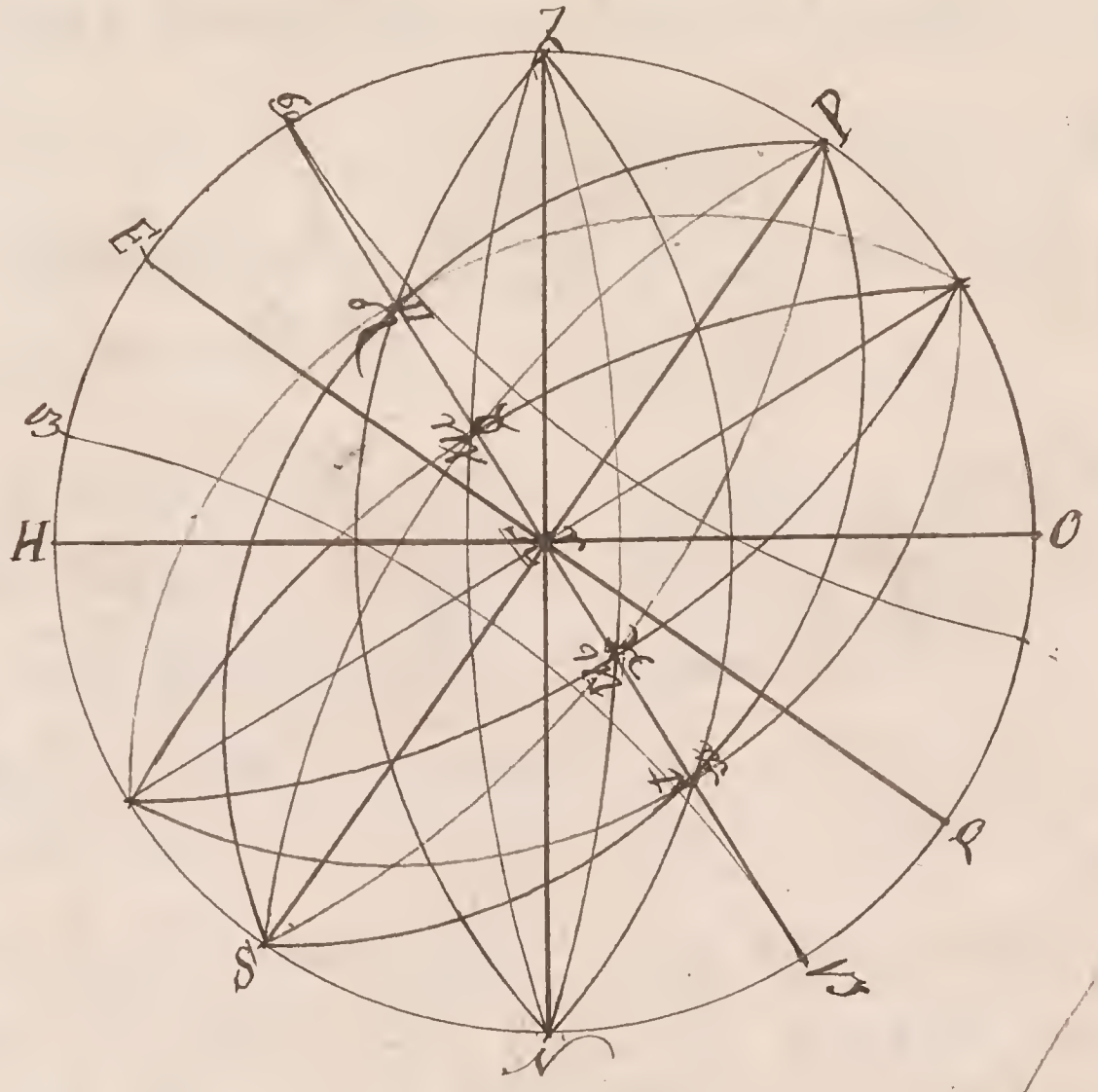
DE ½ 56 : 10
29 : 05
EF 46 : 20
DF 34 : 15
Sum of ½ Sides 55 : 35
∝ 41 : 17
½ 14 : 05
7 : 02

11 : 01
29 : 05
C E 40 : 06
D E 16 : 04



The doctrine of the Sphere 1761

The Stereographick Projection of the Sphere on the Plane of the Meridian of the Solstitial Colure for Whitby in Latitude 54°:30 North



There are four great Circles remarkable in the Heavens; Viz: the Horizon the meridian the Equinoctial, and the Ecliptic.

The Horizon is a great Circle dividing the Heaven into two equal parts; and is that which, on the Liquid Surface of the main terminates our Sight on every side: being represented in the Projection above the right Circle HO:

The meridian is a great Circle, passing thro the Poles: over the Zenith (or Point directly above our Heads) and thro the Nadir (or point directly under our feet); to which when the Sun approaches it is mid-day or noon in the place where you live. In the above Projection the Primitive Circle represents the meridian, Z the Zenith, N the Nadir, and P, S the Poles of the world, in which the the axis or Spindle on which our Globe Continually revolves are Supposed to be fixed.

The Equator, or Equinoctial is a great Circle lying in the middle way between the two Poles; to which when the Sun approaches (about the 21 of march and 23 of September) he makes the days and nights equal throughout the world. It is represented in the above

Projection by the right Circle Æ Q

The Ecliptic is a great Circle Surrounding the Heavens, and Crossing the Equinoctial in two opposite points, at the beginning of aries and Libra, making there an angle of 23½ Q. In this Circle the Sun is ever found; on this all Longd is ~~found~~ Reckoned in the Heavens; and from this the Latd of all the Planets and Constellations is Counted. It is divided into 12 Sings, each of which contain 30, whose names & order are as below

♈ aries ♉ Taurus ♊ Gemini ♋ Cancer ♌ Leo ♍ Virgo	are Called 1st 6 Sings	♎ Libra ♏ Scorpio ♐ Sagittarius ♑ Capricornus ♒ aquarius ♓ Pisces	are Called 2d 6 Sings

These Constellations or Sings are all included within a Zone or Belt which extends 8° on each Side the Ecliptic, and is Called the Zodiack; within which the Planets ~~have their~~ perpetually have their motion. this Circle is represented in the Projection above by the right Circle 69 ♑.

There are besides these four, several others great Circles; as the Colures Azimuth Circles, the Prime Vertical, Circles of Declinations and Circles of Latitudes.

The Colures are two Meridians; the one Called the Sostitial Colure cutting the Ecliptic in the two Tropical points, at the Beginning of Cancer and Capricorn, represented in the foregoing Scheme by the Primitive Circle and the other called the Equinoctial Colure cutting the Ecliptic where it Crosses the Equator, in the beginning of aries and Libra. It is represented in our Projection by the Right Circle Z N

Azimuth Circles, are great Circles, passing thro the Zenith and Nadir, and the Horizon at Right Angles; such, in our Projection, are all the Circles that pass between Z and N.

The prime Vertical, is an Azimuth Circle passing thro the East and West Points of the Compass: represented in the above Projection by the right Circle Z N

Circles of Declination are great Circles passing thro the Poles of the World. and Cutting the Equinoctial at right angles: Such in the above Scheme are all these Circles that pass between P & S.

Circles of Latt.d are great Circles. passing thro the Poles of the Ecliptic and crossing the Ecliptic at right angles; as in the Projection are those Circles passing between A and B.

as for Lesser Circles in the Heavens we have the Tropics. the Polar Circles Parallels of Declination Parallels of Latt.d and almicanthers or Parallels of altt.d

The Tropics are two. Situate one on each Side of the Equator: from which they are distant 23°.29'. that on the North Side is called the Tropic of Cancer to which when the Sun comes about the 22.th Day of June the days are Longest in North Latt.d and Shortes in South Latt.d It is represented in the Projection by the Parallel Circle 69 69.

the other or the South Side is called the Tropic of Capricorn; and when the Sun approachs it about the 22.th of December. the days are Shortes in North Latt.d and Longest in South Latt.d this is represented in our Scheme by the parrallel Circle VJ VJ.

the Polar Circles are also two; one of which encompases each Pole of the World at the distant of 23°.29' that about the North Pole [B a C] is called the artic Circle and that about the South Pole [A b D] the antertic.

Parallels of Declination are small Circles. supposed to be drawn parallel to the Equinoctial—

Parallels of Latt.d are small Circles Supposed to be drawn parallel to the Ecliptic

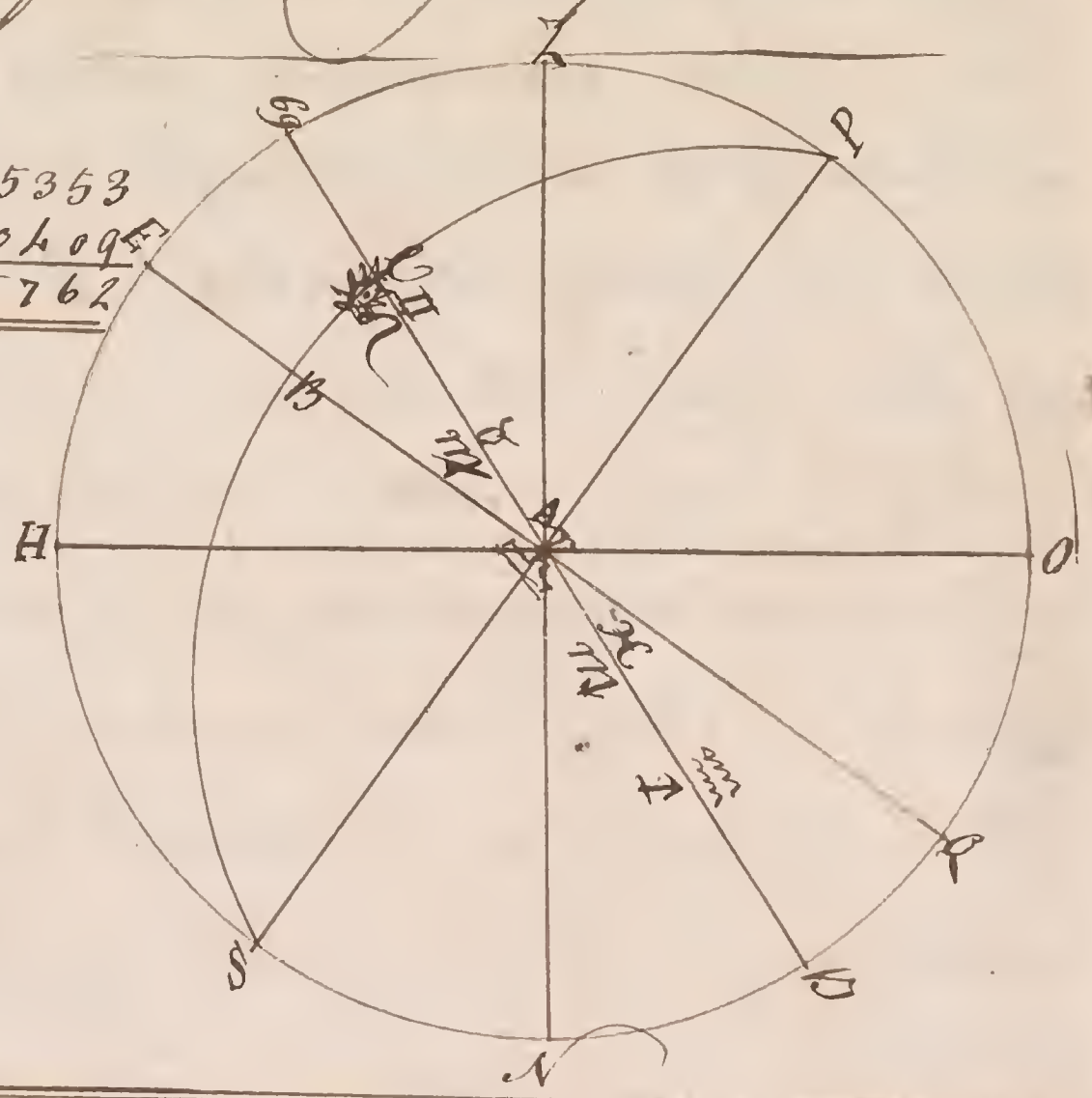
almicanthers or Parallels of altt.d are small Circles supposed to be drawn parallel to the Horizon

Prob. 1. Given the Sun's Ecliptic place to find his Declination

The Sun's Declination is his Distance from the Equinoctial

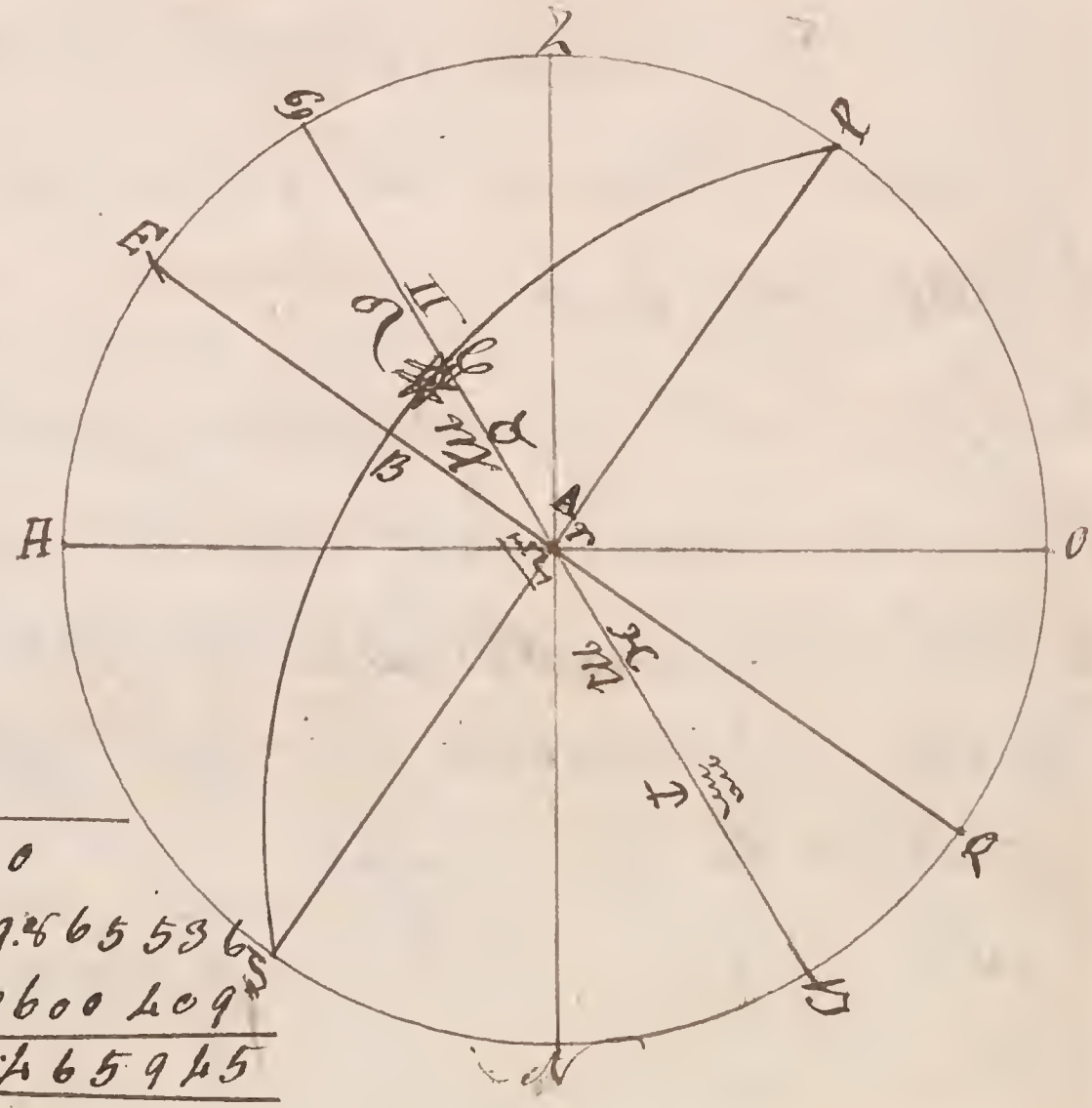
The Sun's Ecliptic place being ♊ 7:25 I demand his Declination

as Radius ∠B ---- 90.00 -- 10.
To ∠ S Ecliptic place A ☀ 67.25 -- 9.965353
To is Oblique Ecliptic ∠A 23.29 -- 9.600409
To Decl: B ☀ - 21.35 N 9.565762



The Sun's Ecliptic place being ♌ 12:48 I demand his Declination

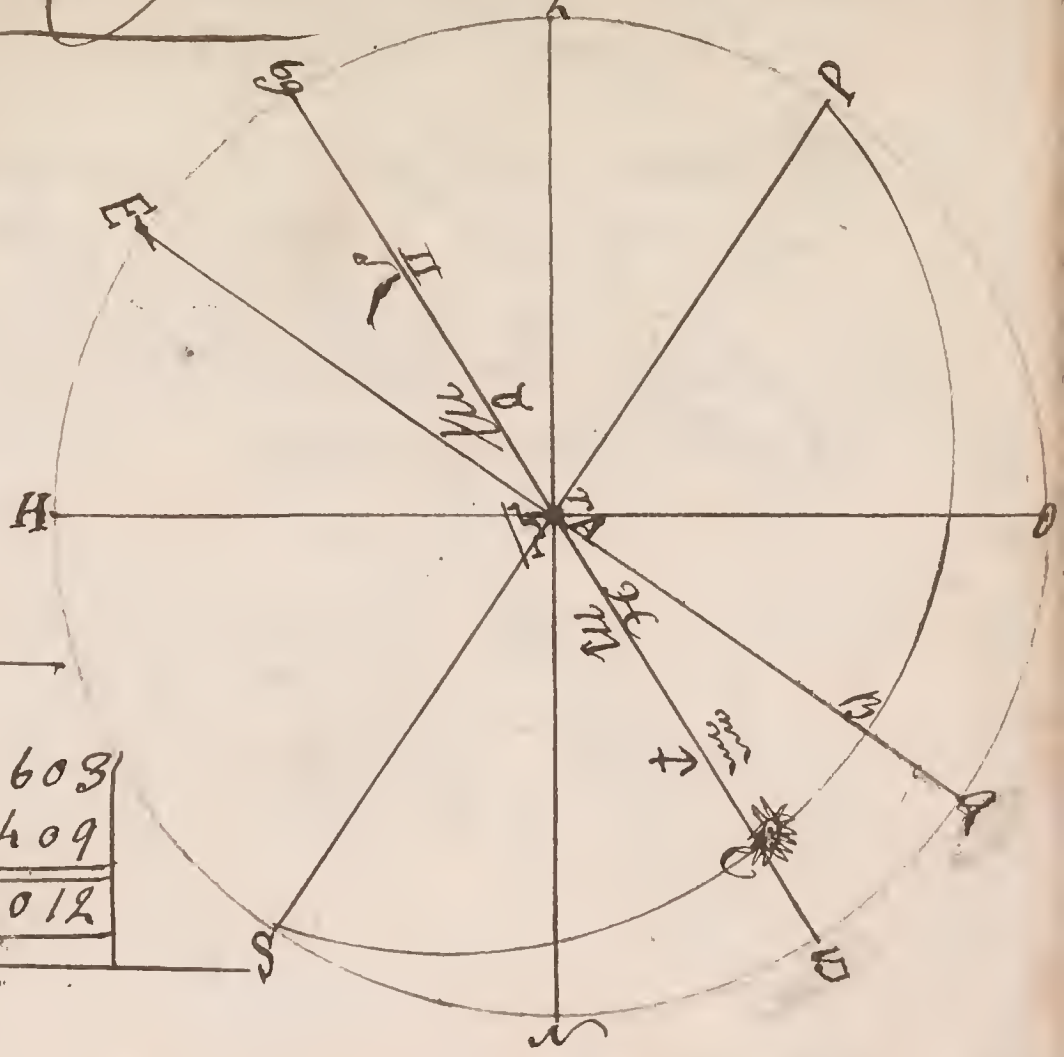
Ecliptic place 60.00
12.48
47.12



as Radius ∠B ..... 90.00 .. 10
To ∠ S Ecliptic place A ☀ .. 47.12 .. 9.865536
To is S Oblique Ecliptic ∠A .. 23.29 .. 9600409
To S Decli: B ☀ ... 17.06 N 9.465945

The Sun's Ecliptic place being ♈ 14°:50 I demand his Declination

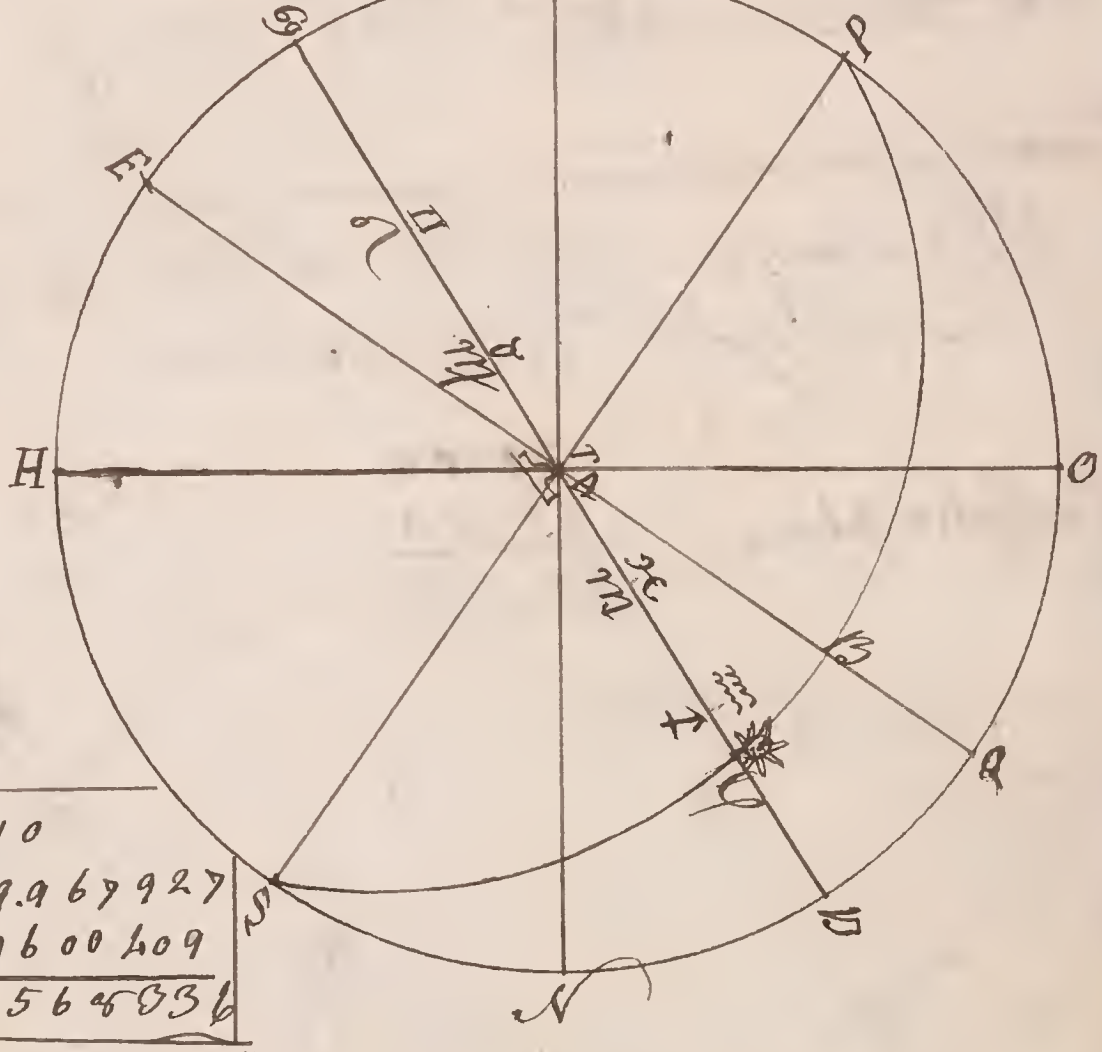
Ecliptic Place
60°00
14°50
74°50



as Radius ∠ B ------ 90°0' --- 10.
Is ∠ of Ecliptic place ♈ 74°50 --- 9.9 6 4 6 0 3
So is ∠ Oblique Ecliptic 23°29 - 9.6 0 0 4 0 9
To ∠ Decli: B ♈ 22°38 S --- 9.5 6 5 0 1 2

The Sun's Ecliptic Place being ♉ 21°:45 I demand the Declination

Ecliptic Place
90°00
21°45
66°15



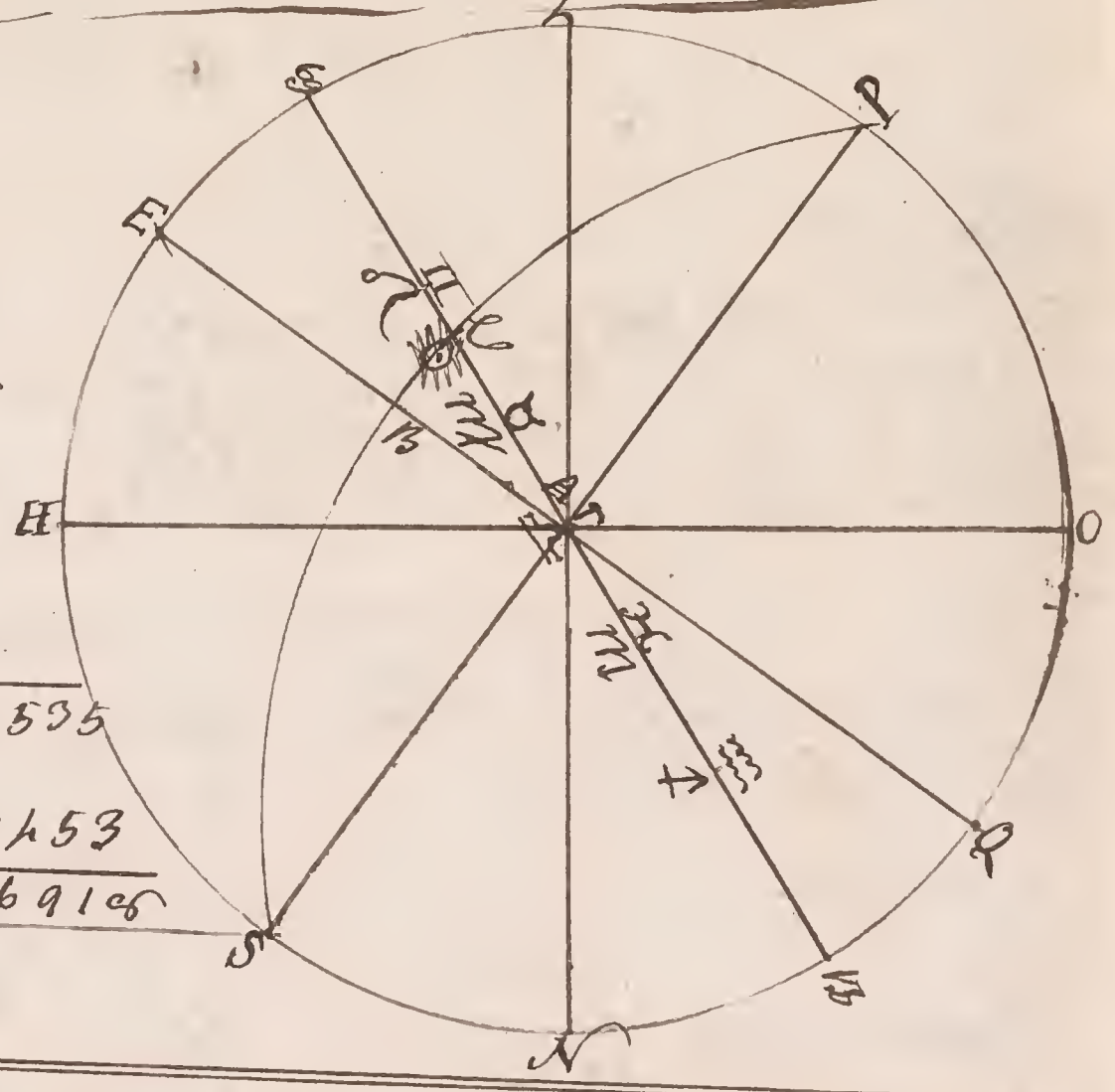
as Radius ∠ B ------- 90°00' 10
Is ∠ of Ecliptic place ♉ 66°15 - 9.9 6 7 9 2 7
So is Oblique Ecliptic ∠ A 23°29 - 9 6 0 0 4 0 9
To ∠ Decli: B ♉ 21°45 S --- 9.5 6 6 8 3 6

Prob. 2. Given the Sun's Ecliptic place to find his Right ascension

The Sun's Right ascension is his Distance from the Beginning of ♈ counted on the Equinoctial

The Sun's Ecliptic place being ♉ 18° 35' I demand his Right ascension

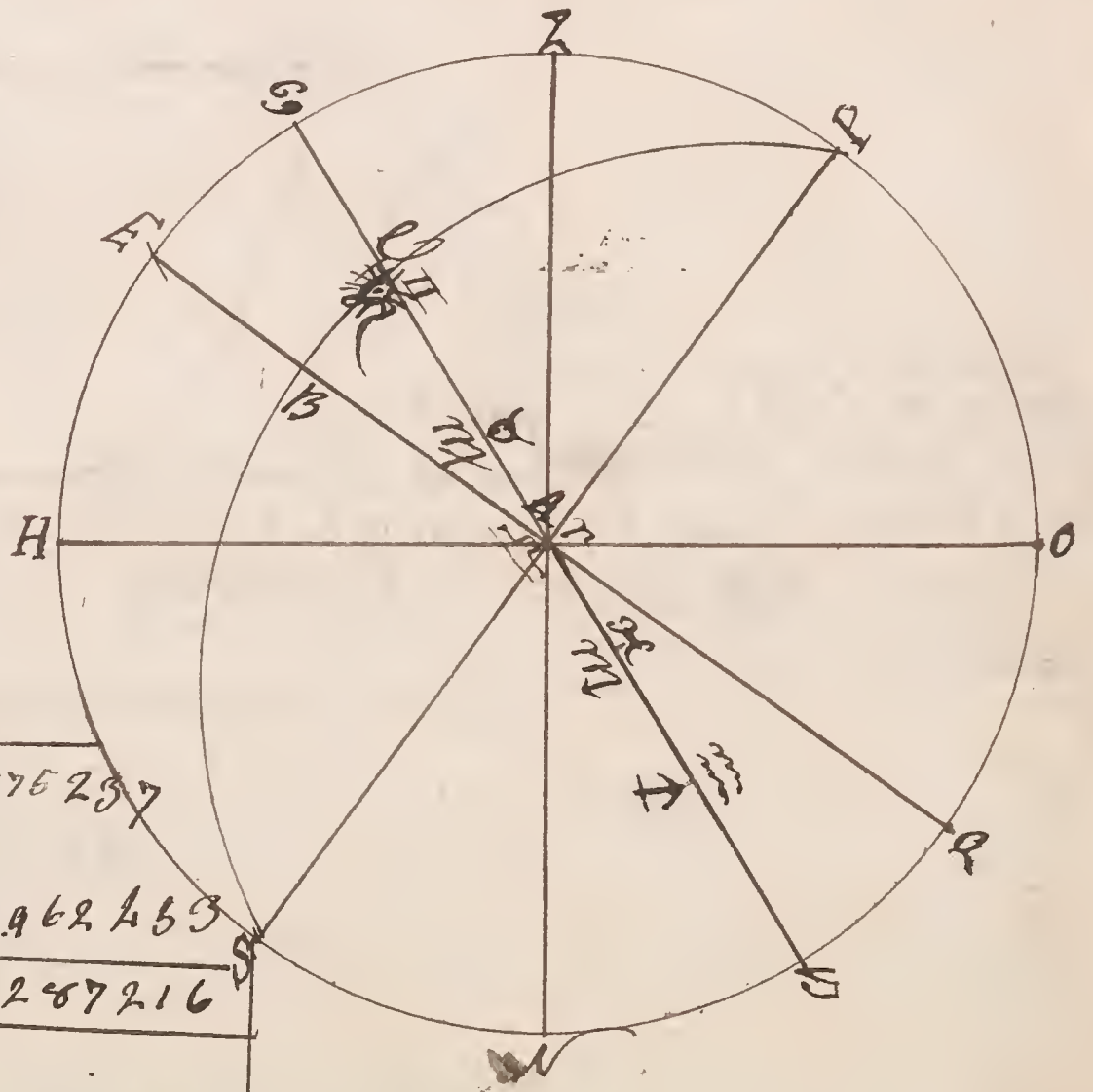
30°00
18°35
Ecliptic place 46°35



as I 6 Ecli: place A ☉ 46°35 ... 9.945535
I. to Radius ... 40°00 .. 10.
So is I 6 oblique Ecli: A 23°29 - 9.962453
So I ☉ Right ascen: - 46°07 - 10.016918

The Sun's Ecliptic Place being ♌ 25° 20' I dem. his Right ascension

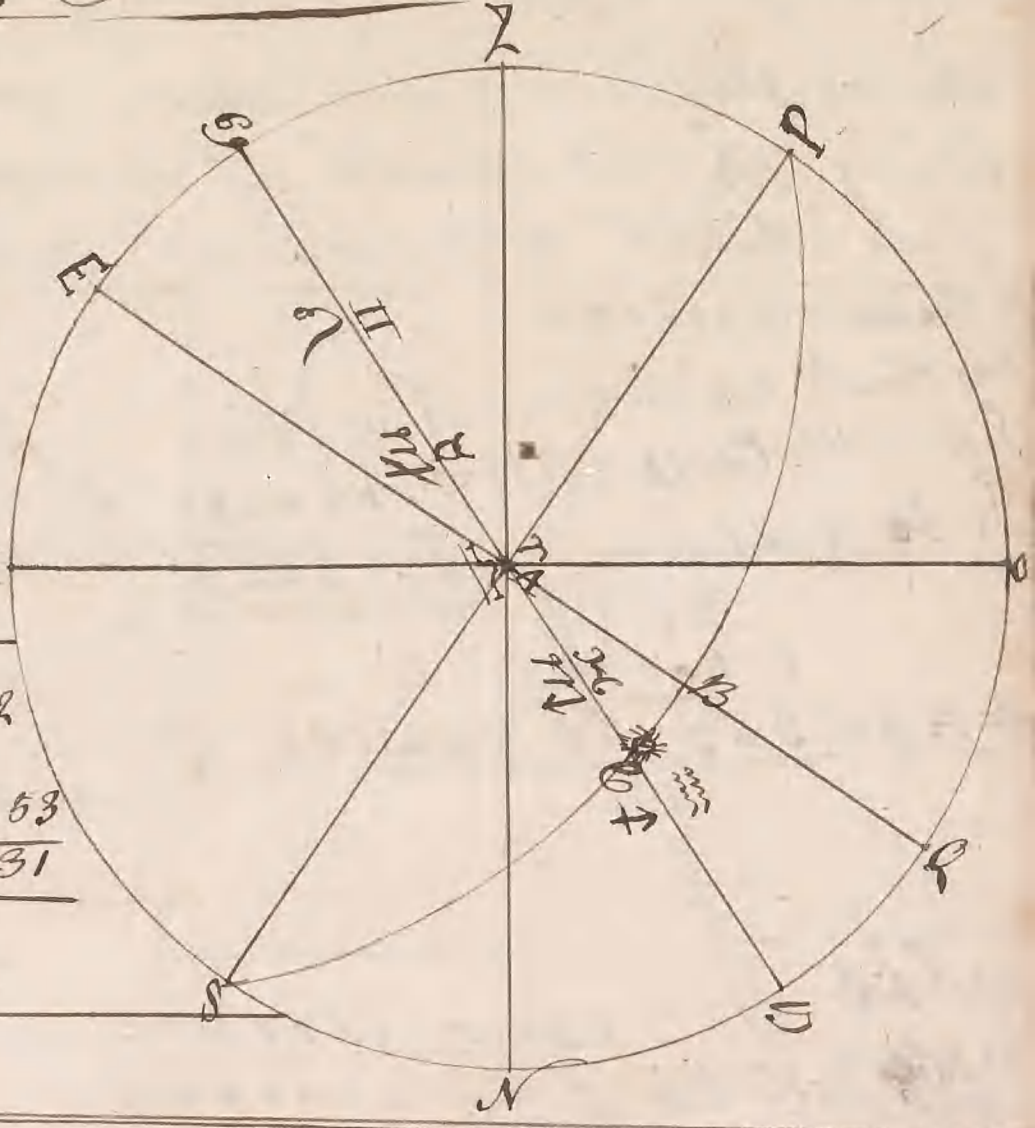
90°00
25°20
Ecliptic place 64°40



as I 6 Ecli: place A ☉ 64°40 ... 9.675237
I. to Radius 90°00 10
So is I 6 oblique Ecli: A 23°29 9.962453
So I ☉ Right ascen: 62°42 - 10.287216

180°00
Sun Right 117°18 ascension

The Sun's Ecliptic place being ♑ 17° 10′ I desire his Right Ascension

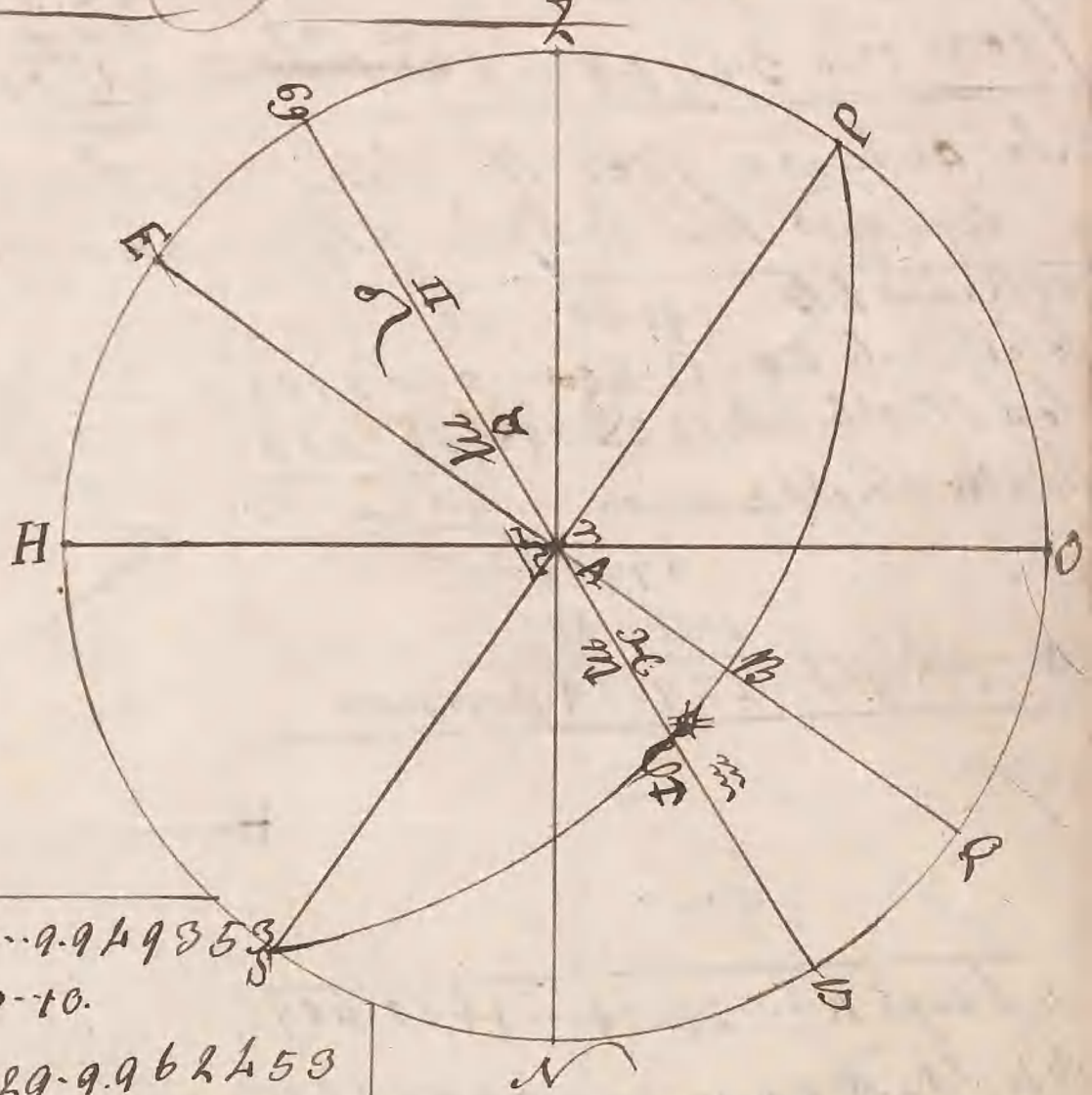


Ecliptic Place
30°00
17°10
47°10

as To Ecli: place A☀ --- 17°10 .. 9.967122
So to Radius 1 B - - 90°00 - - 10
So is So Oblique Ecliptic 1 A 23°29 : 9.962453
So To ☀ Right ascension - 44°42 - 9.995331

160°00
☀ Right 224°42 ascension

The Sun's Ecliptic Place being ♒ 11° 40′ I demand his Declination



Ecliptic Place
60°00
11°40
45°20

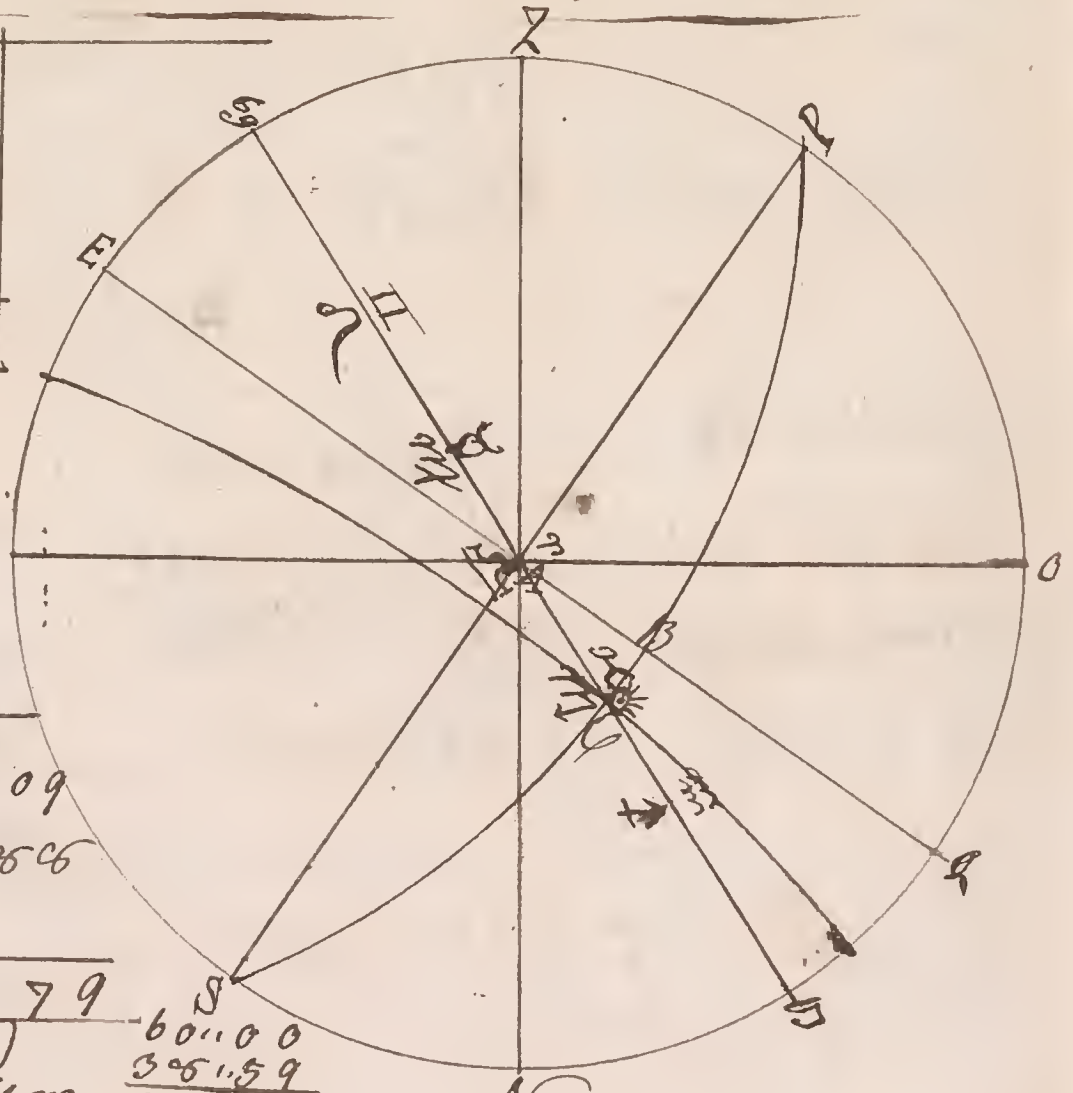
as To Ecliptic place A☀ 45°20 .. 9.949353
So to Radius ... 1 B - 90°00 - 10.
So is So Oblique Ecliptic 1 A 23°29 - 9.962453
So To ☀ Right Ascension 45°52 10.013100

360°00
☀ Right ascension 14°06 ion

Prob. 3. Given the Sun's Declination to find his Ecliptic place and Right ascension

In the Winter Season anno 1761 the Sun's Declination being 14°: 31 South I demand his Ecliptic place and Right ascension

as Radius ∠ B 90°,00 - - -
Is to ☉ Decli: B☉ 14°,31 - - - 9-413179
So is ☉ Obli: Ecli: A 23°,29 to 9.962044
So ☉ Right ascen: 9.775223
86°,35
360°,00
☉ Right 323°,25 Ascension

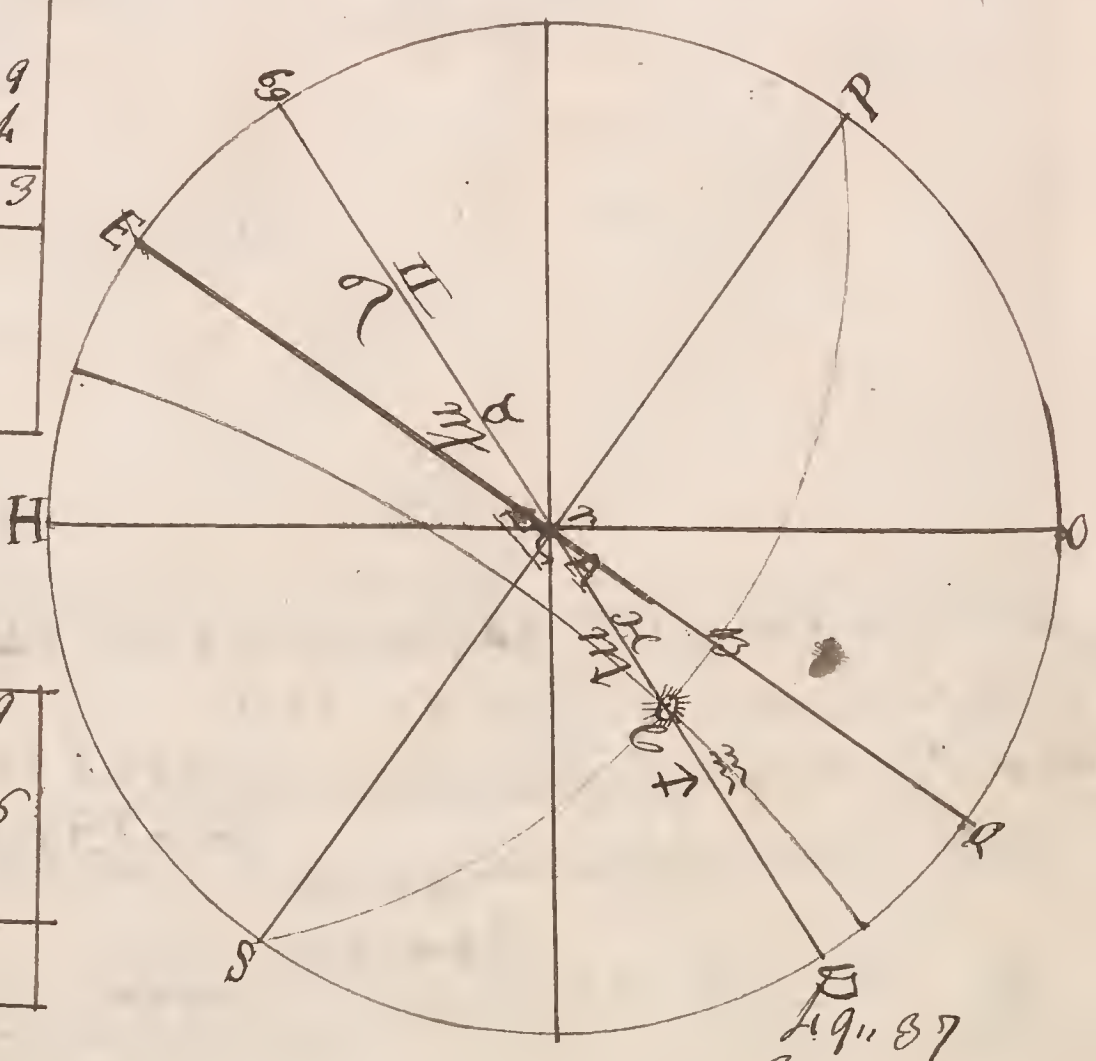


as ☉ A - - - - 23°,29 - - 9600409
Is to ☉ Decli: B☉ 14°,31 - 9.399056
So is Radius - 90°,00 - 10
So ☉ ☉ Ecli: place 9.795679
from ♈ is 361°,59 and ~~exceeds~~ is in ♏ 21°,01

60°,00
301°,59
21°,01

In autumn 1761 the Sun's Declination being 17°.40 South I demand his Ecliptic place and Right Ascension

as Radius ∠ B - - - 90°,00 - - 10.
Is to ☉ Decli: B☉ - 17°,40 - - - - - 9503109
So is ☉ Obli: Ecli: ∠A 23°,29 10.362044
So ☉ Right ascension 9.865153
47°,09
☉ Right 227°,09 Ascension



as ☉ angle A - - 23°,29 - - 9600409
Is to ☉ Decli: B☉ 17°,40 - - 9.462126
So is Radius ∠ B 90°,00 - 10
So ☉ ☉ Ecli: place ∠ 9°,57 9.062529

49°,87
30°,00
☉ place 19°,37 ♍

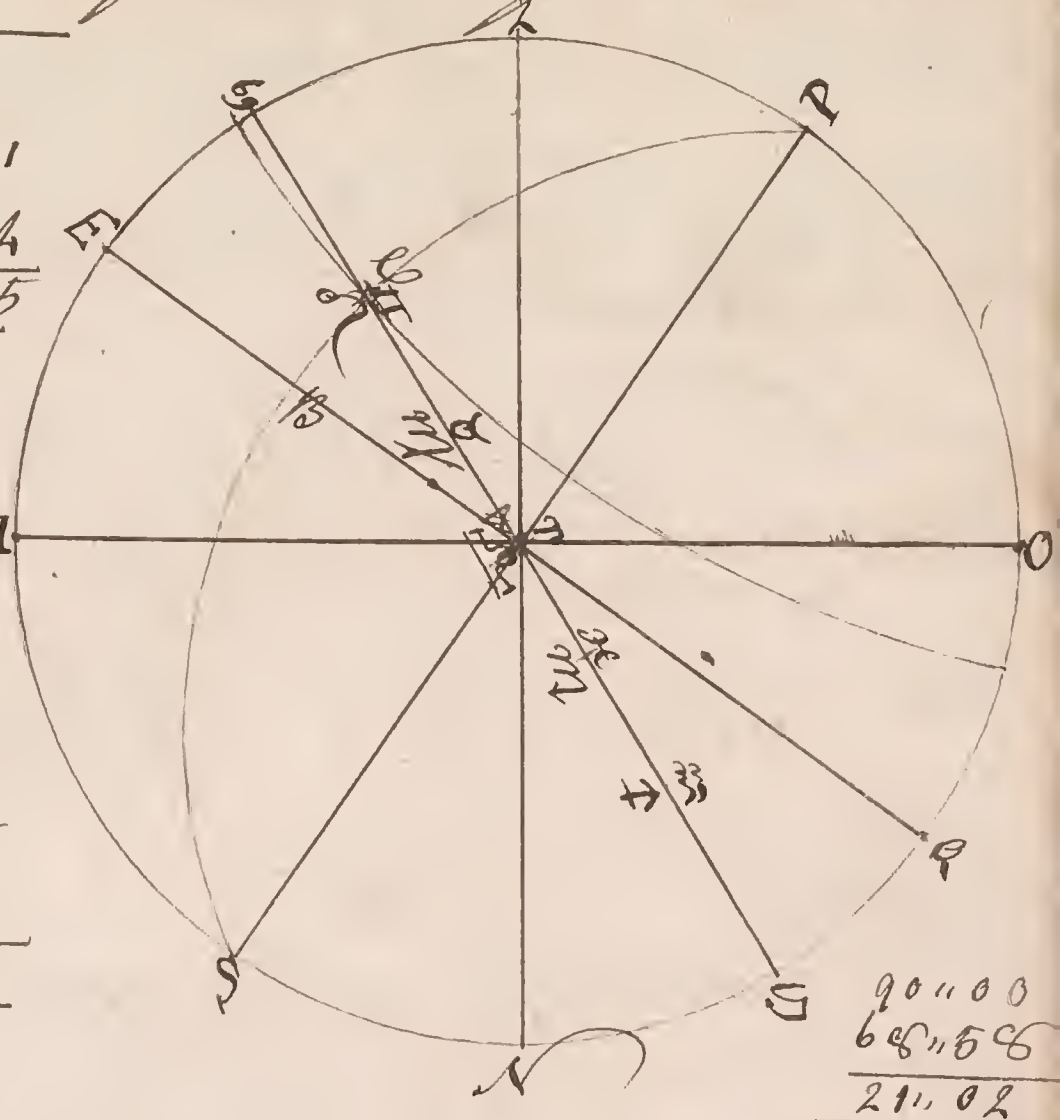
Suns Ecliptic place is in ♍ 19°,37

In Summer 1761 the Sun's Declination being 21°:50'
North I demand his Ecliptic place & Right Ascension

As Radius . . . . . 90°,00 -:10
Is to S Decli: B☀ . . 21°,50 : 9.602761
So is S Oblique Ecli: 23°,29 10.362044
To S☀ Right Ascen: 9964605

67°,15
1°60°,00

☀ Right 112°,45 ascension



As Angle A . . . . 23°,29 . . 9.600409
Is to S Decli: B☀ 21°,50 - 9.570485
So is Radius . . 90°,00 - 10
To S☀ Ecliptic place 9.970026

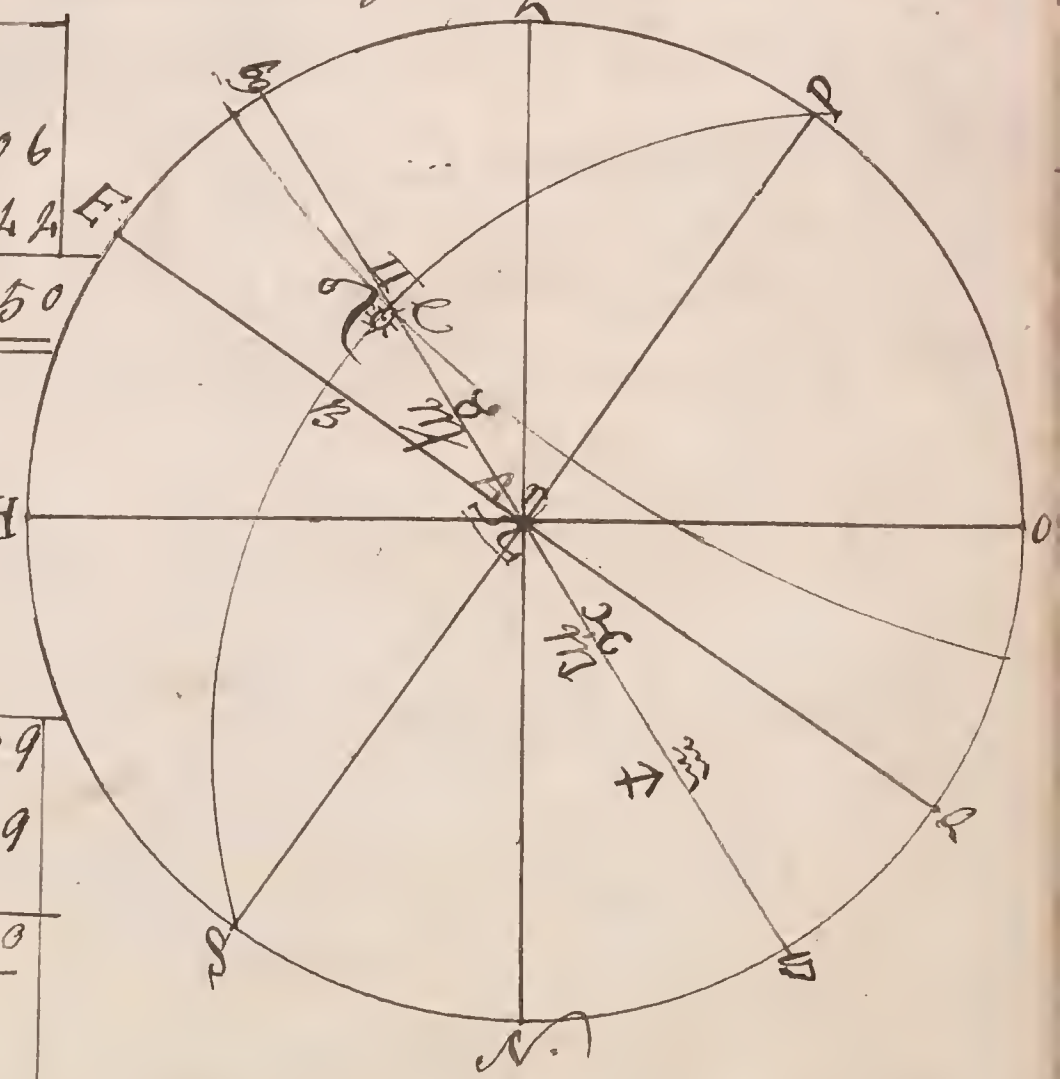
66°,56

Suns Ecliptic place is in 69 - 21°,02

90°,00
66°,56
21°,02

In Spring 1761 the Sun's Declination being 20° North
I demand his Ecliptic Place and Right Ascension

As Radius AB . . . 90°,00 10
Is to S Decli: B☀ . . . 20°,00 . . . 9.561006
So is S Oblique Ecli: 23°,29 9.362044
To S☀ Right Ascens: 56°,53 9.923050



As Angle A . . . 23°,29 . . . 9.600409
Is to S Decli: B☀ 20°,00 . . 9.534029
So is Radius AB 90°,00 . . . 10
To S☀ Ecli: place 59°,12 9.933920

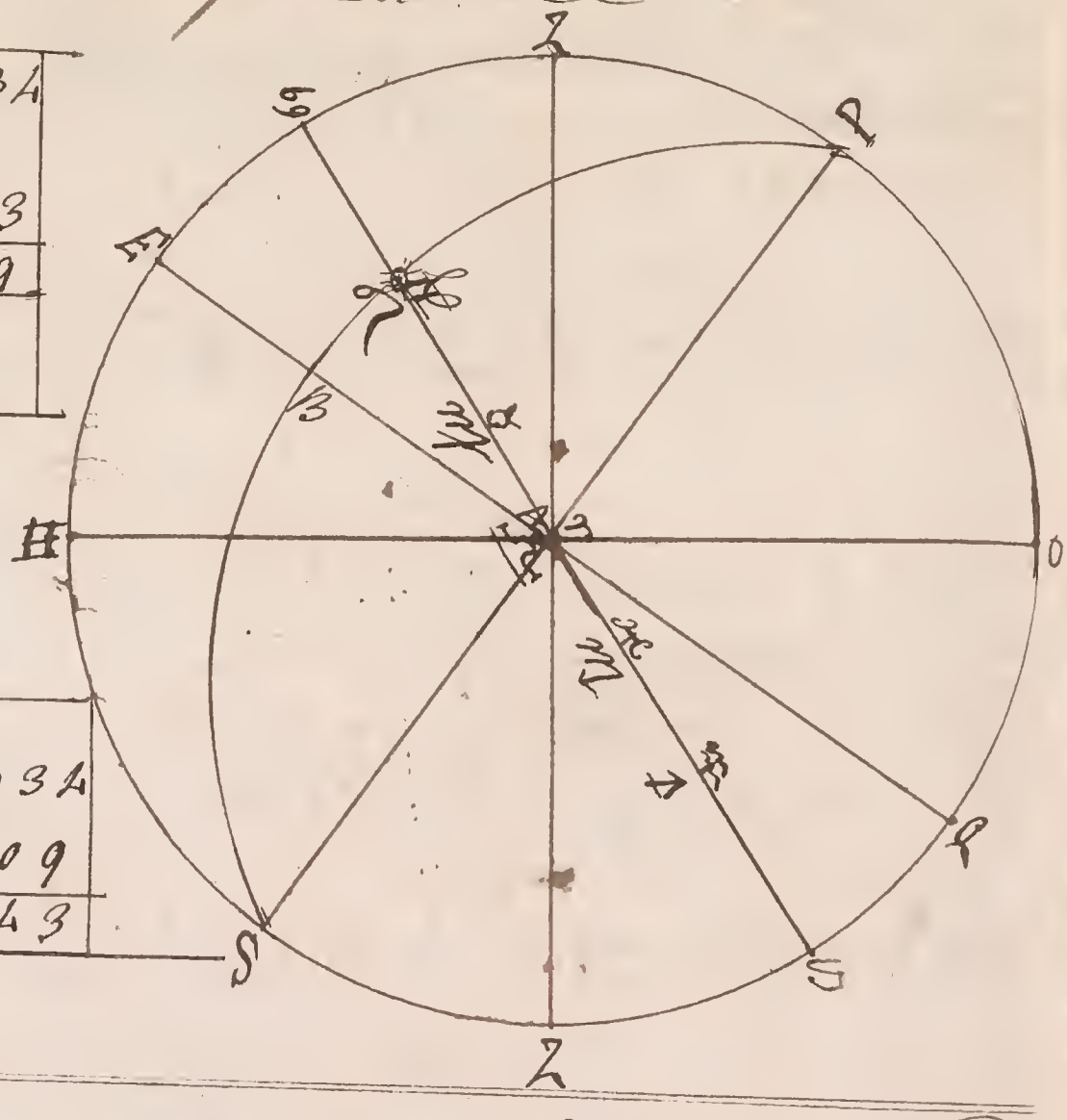
30°,00

☀ Ecli: place is in 29°,12

Prob. A. Given the Sun's Right ascension to find his Declination and Ecliptic place

The Suns Right ascension being 116° 20' I dem. his Declination and Ecliptic place

as ☉ Right ascen:	63° 40'	10.305434
☉ to Radius ∠B	90° 00'	10.
So is ☉ ∠ Angle A	23° 29'	9.962453
☉ to ☉ Ecli: place	65° 35'	9.657019
☉ place is in ♋	90° 00'	
	24° 25'	

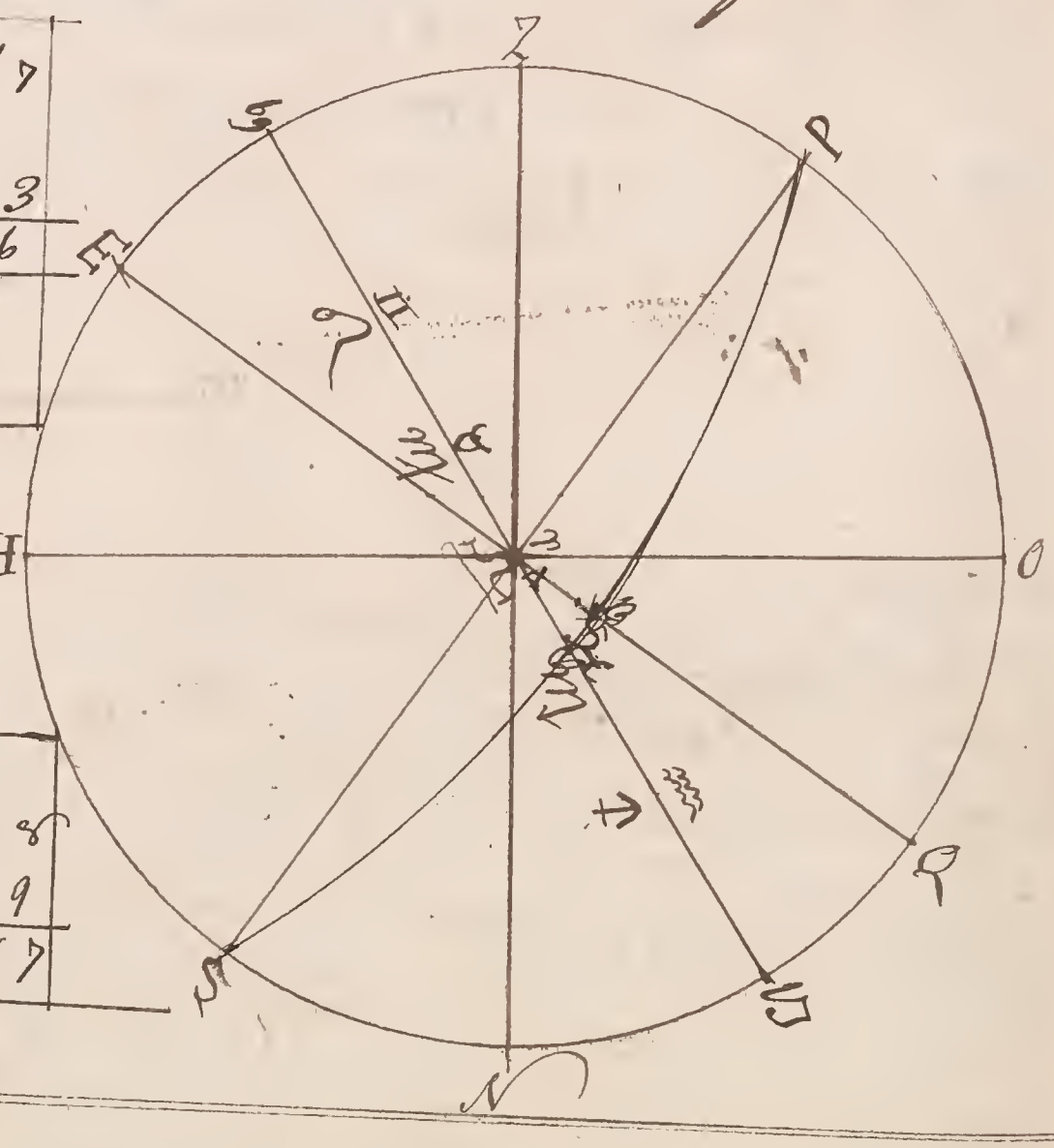


as Radius ∠B	90° 00'	10.
☉ to ☉ Ecli: place A ☉	65° 35'	9.958734
So is ☉ angle A	23° 29'	9.600209
☉ to ☉ Decli: B ☉	21° 15' N	9.559143

The Suns Right ascension being 336° 20' I dem: his Declination and Place in the Ecliptic

as ☉ Right ascen:	23° 40'	9.641747
☉ to Radius ∠B	90° 00'	10.
So is ☉ ∠ Angle A ☉	23° 29'	9.962453
☉ to ☉ Ecli: place	25° 33' =	10.320706
☉ place is in ♌	30° 00'	
	4° 27'	

	336° 20'
	360° 00'
☉ Right ascension	23° 40'



as Radius ∠B	90° 00'	10.
☉ to ☉ Ecli: place	25° 33'	9.634778
So is ☉ angle A	23° 29'	9.600209
☉ to ☉ Decli:	9° 24' S	9.234987

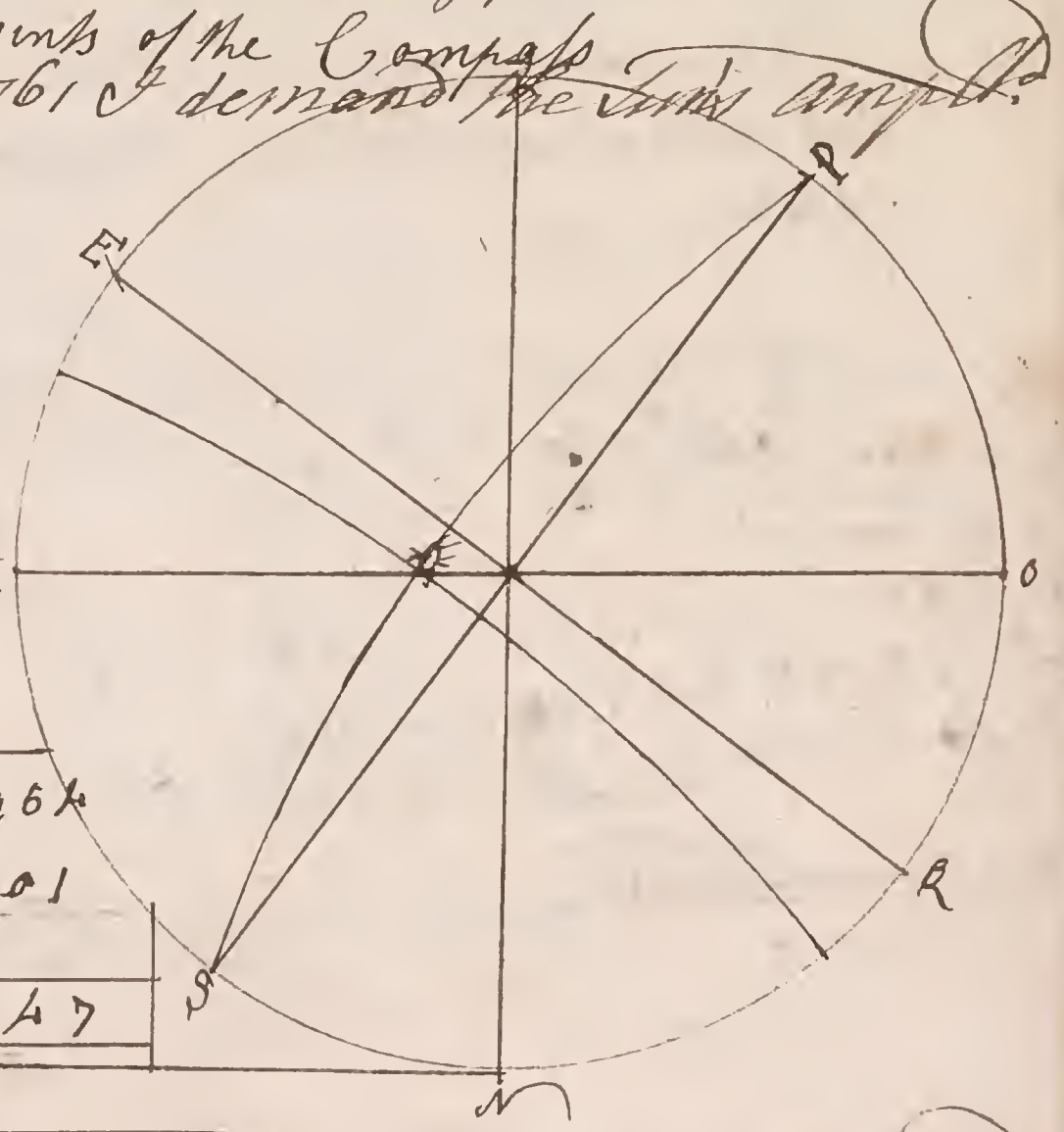
Prob.: 5 To find the Suns amplitude

The Suns amplitude is his Distance at rising from the East and at Setting from the west points of the Compass

at Whitby February 11th. 1761 I demand the Suns ampl.

90..00
54..30
35..30

☉ Lat.
☉ Decl.

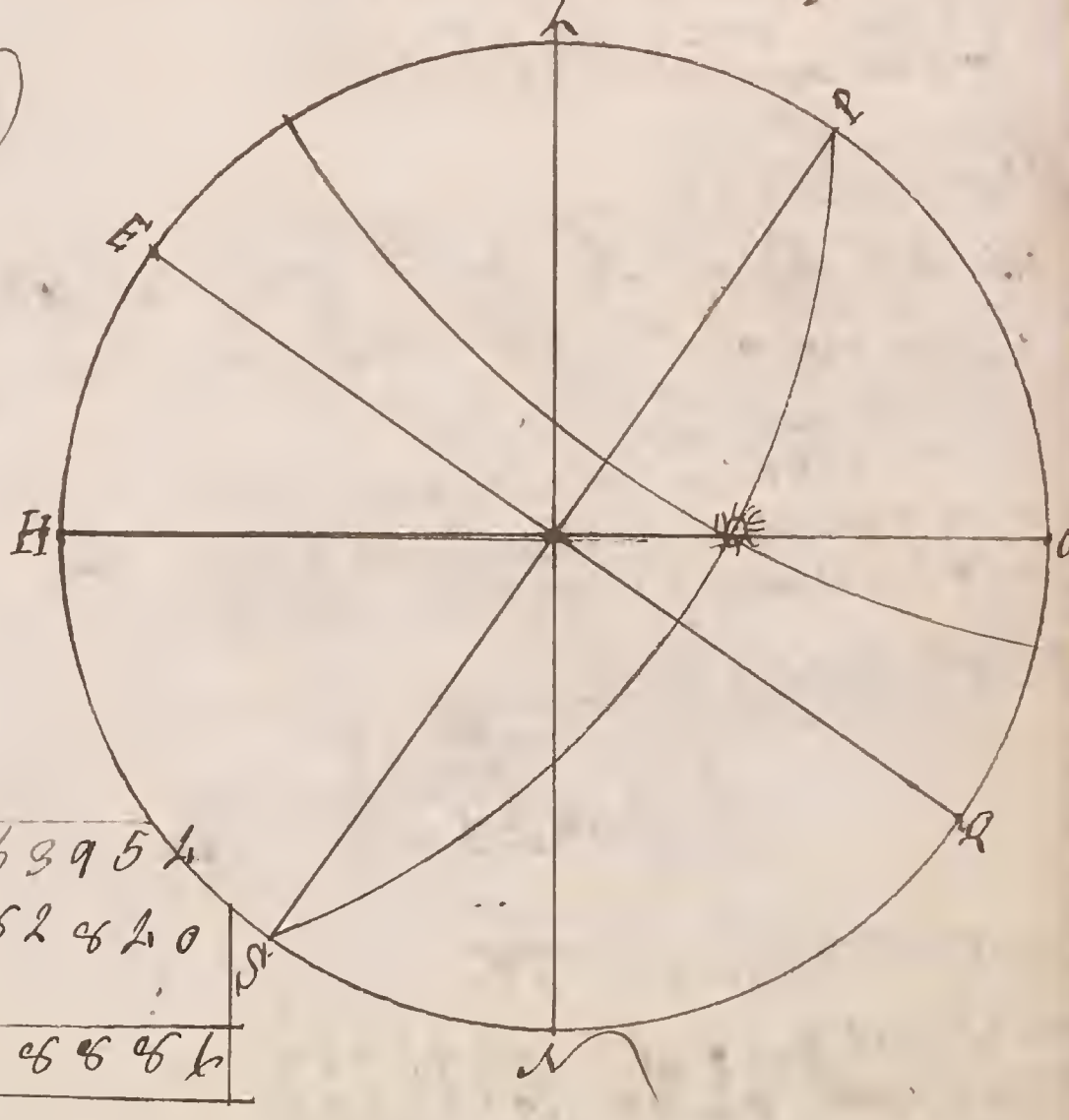


as ☉ Lat. L A 35..30 .. 9.76396
To ☉ Decl.: 13..52 - 9.3.79601
To is Radius - 90.. 0.0
To ☉ ampl.: - 24..22 S 9.61546

at Whitby June 4th. 1761 I demand the Suns ampl.

90..00
54..30
35..30 Lat.

☉ Decl.



90..00
Declin. 22..30. N

☉ Decl.: 67..30

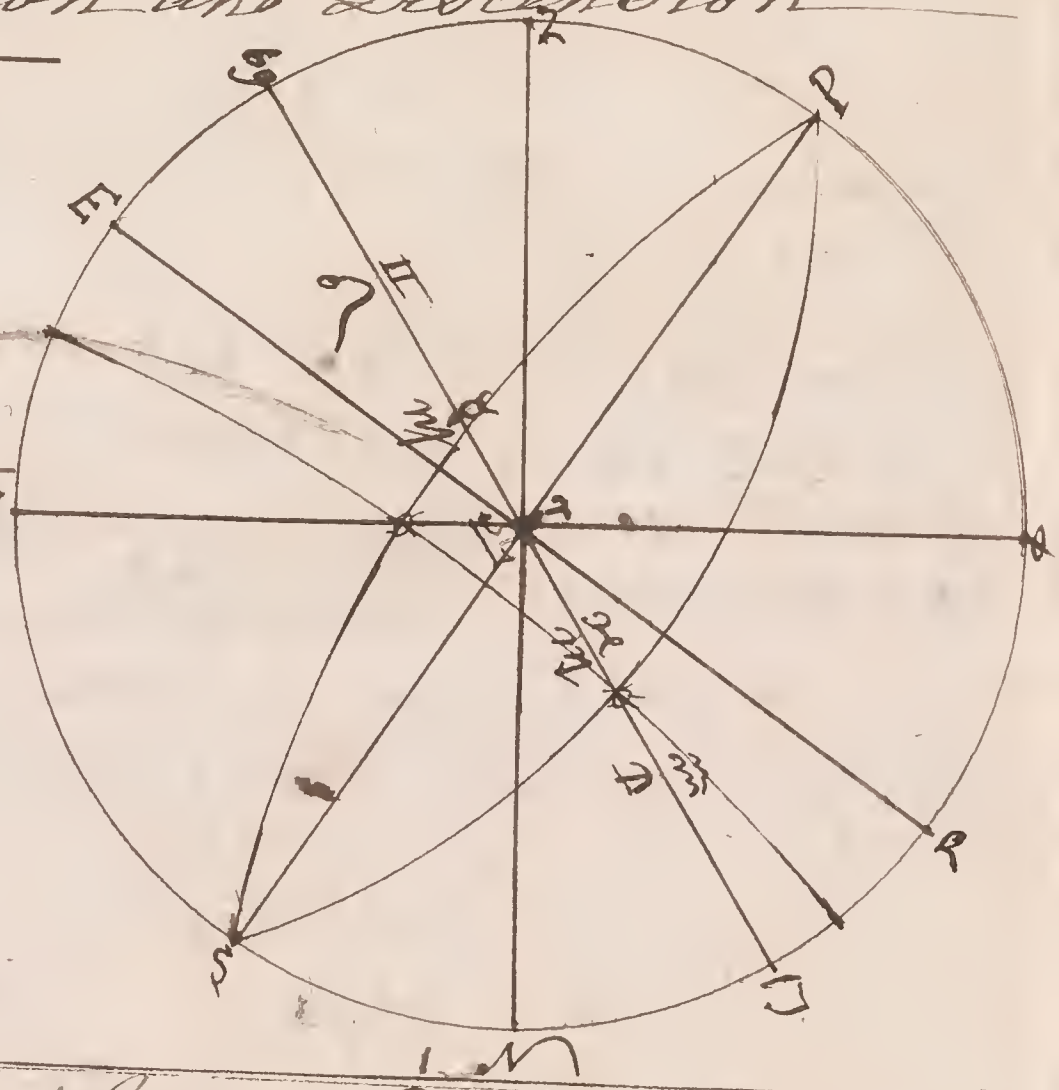
as ☉ Lat. L A 35..30 .. 9.76395
To ☉ Decl.: - 22..30 .. 9.56240
To is Radius L B - 90..00 - 10
To ☉ ampl. L 11..13 N 9.61646

Prob: 6 To find the oblique ascension and Descension of the Sun——

Oblique ascension and Descension is that part of the Equator that rises or sets with the Center of the Sun or Star in an Oblique Sphere——

At Whitby February 12th 1761 I demand the Sun's oblique ascension and Descension

As Radius	90:00	10 —
☉'s ☊ to ☉'s Decli:	♓ 13:32	9.3961465
So is ☉'s Obli: Ecli:	23:28	10.3620444
So ☉'s Right ascen:	33:3	9.7473509
	360:00	
☉'s Right ascen:	326:22	



As Radius	90:00	10
☉'s ☊ to ☉'s Decli:	♓ 13:32	9.3961465
So is ☉'s Lat:	54:30	10.1467732
So ☉'s ☊ ascen:	♓ 19:43	9.5296197
	326:22	
oblique ascen:	345:39	
oblique Dist:	306:39	

At Whitby July 15th 1761 I demand the Sun's oblique Ascension and Descension

As Radius	♋	90:00 — 10.
☉'s ☊ to ☉'s Decli:	♉	21:31 — 9.5957664
So is ☉'s Obli:	Ecli:	23:29 — 10.3620444
So ☉'s ☊	Right ascen:	65:09 — 9.9577612
		150:00
☉'s	Right ascens:	114:51

90:00
21:31
☉'s Decli: 68:29

As Radius	♋	90:00 — 10.
☉'s ☊ to ☉'s Decli:	♉	21:31 — 9.5957664
So is ☉'s Lat:		54:30 — 10.1467732
So ☉'s ☊ ascen:	♌	23:33 — 9.7465500
		114:51
oblique Descen:		47:24
oblique ascen:	♋	1:1

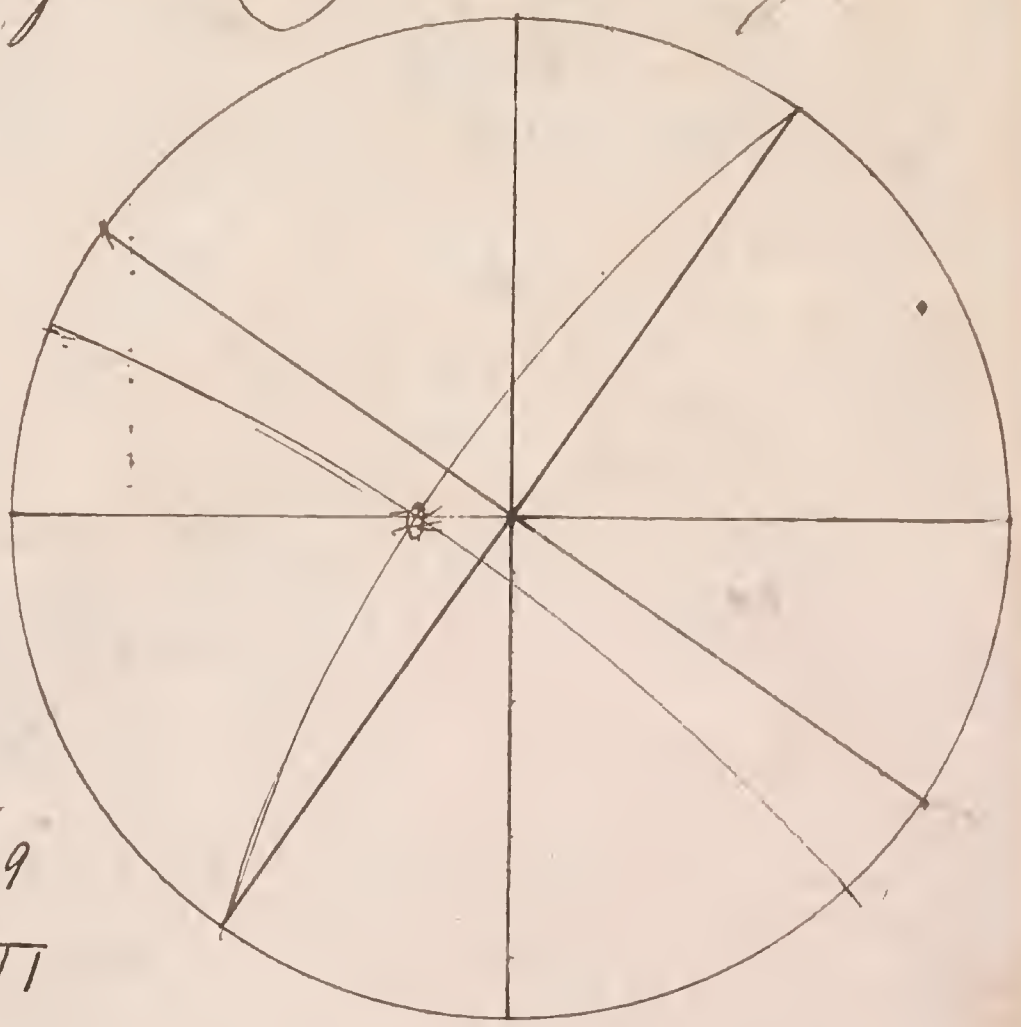
Prob: 7 To find the ascensional Difference with the time of the Suns rising and setting: as also the Length of the Day and night in any Latitude

ascensional Difference is the Difference between the Right and oblique ascension

At Whitby February 14th 1761 I demand the ascensional differences, the Time of the Sun's Rising and Setting, and the Length of the Day and the Night

As Radius	∠B	90 00	.10
So ☉ Decli	B☉	12 51	9.35 61 49
So is ☉ Lattd	LA	54 30	10.14 67 32
So ☉ Asc.	☉	146 39	9.50 44 61

90 00
Sun Declinati: 12 51
☾ Declinati: 77 09



H M
15 ——— 1 ——— 146 39
60 60
900 11119
900
219
60
900 13140 14
900
4140
3600
540
60
900 32400 36
2700
5400
5400

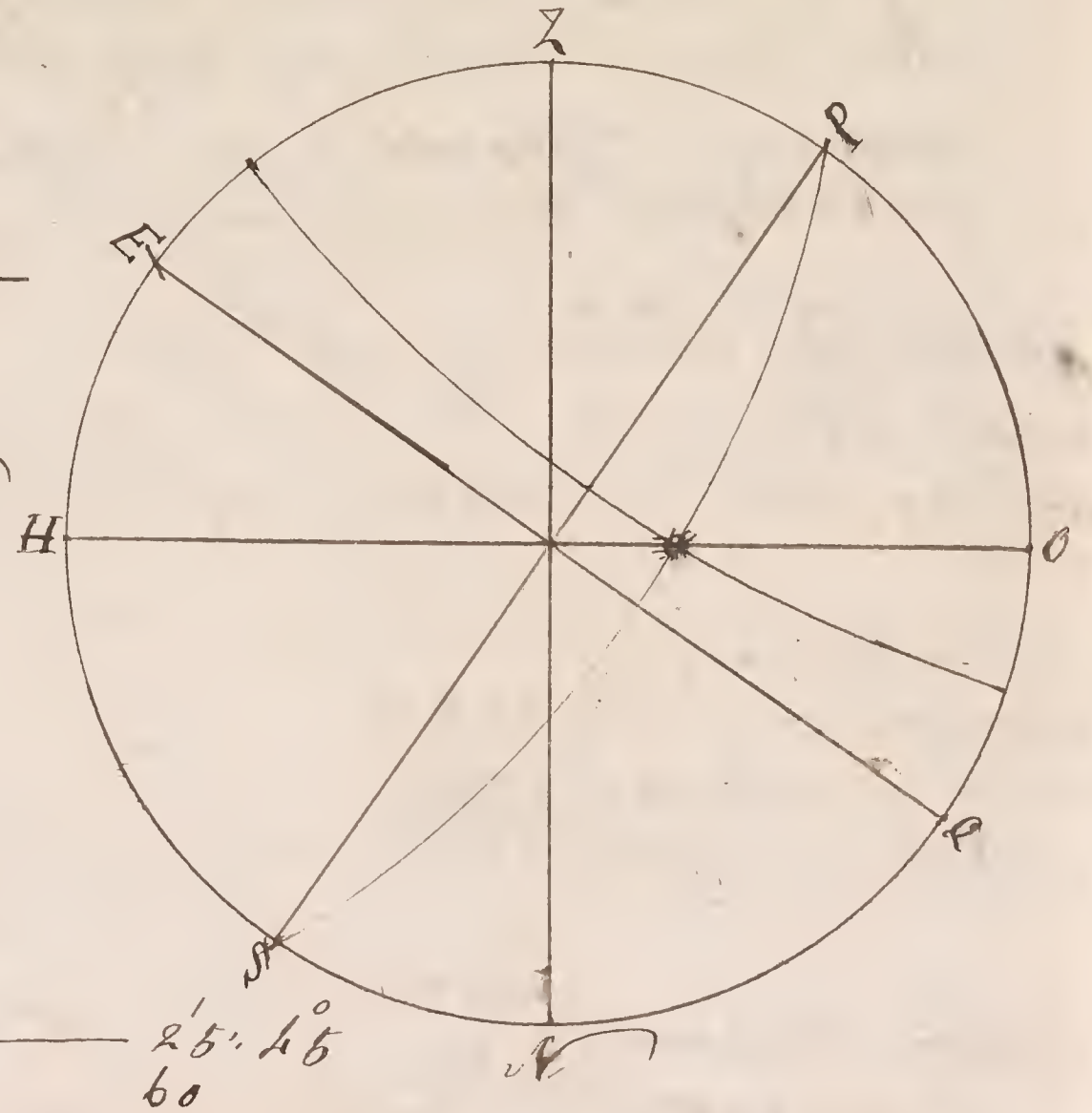
H m s
6 00 00
1 14 36
7 14 36 Sun Rise
4 45 24 Sun Set
2
9 30 48 Length Day
7 14 36
2
14 29 12 Lenth Night

15 make one Hour

At Whitby May 8th 1761 I demand as before

as Radius	90 ° 0 0		10
☽'s Decli:	17 ° 13		9.4911460
So is ☽ Lat:	5 4 ° 30		10.1467332
To So Ascenl:			9.6377912
	25 ° 45		

90 ° 00
Declint: 17 ° 13 N
☾ Declint: 72 ° 47



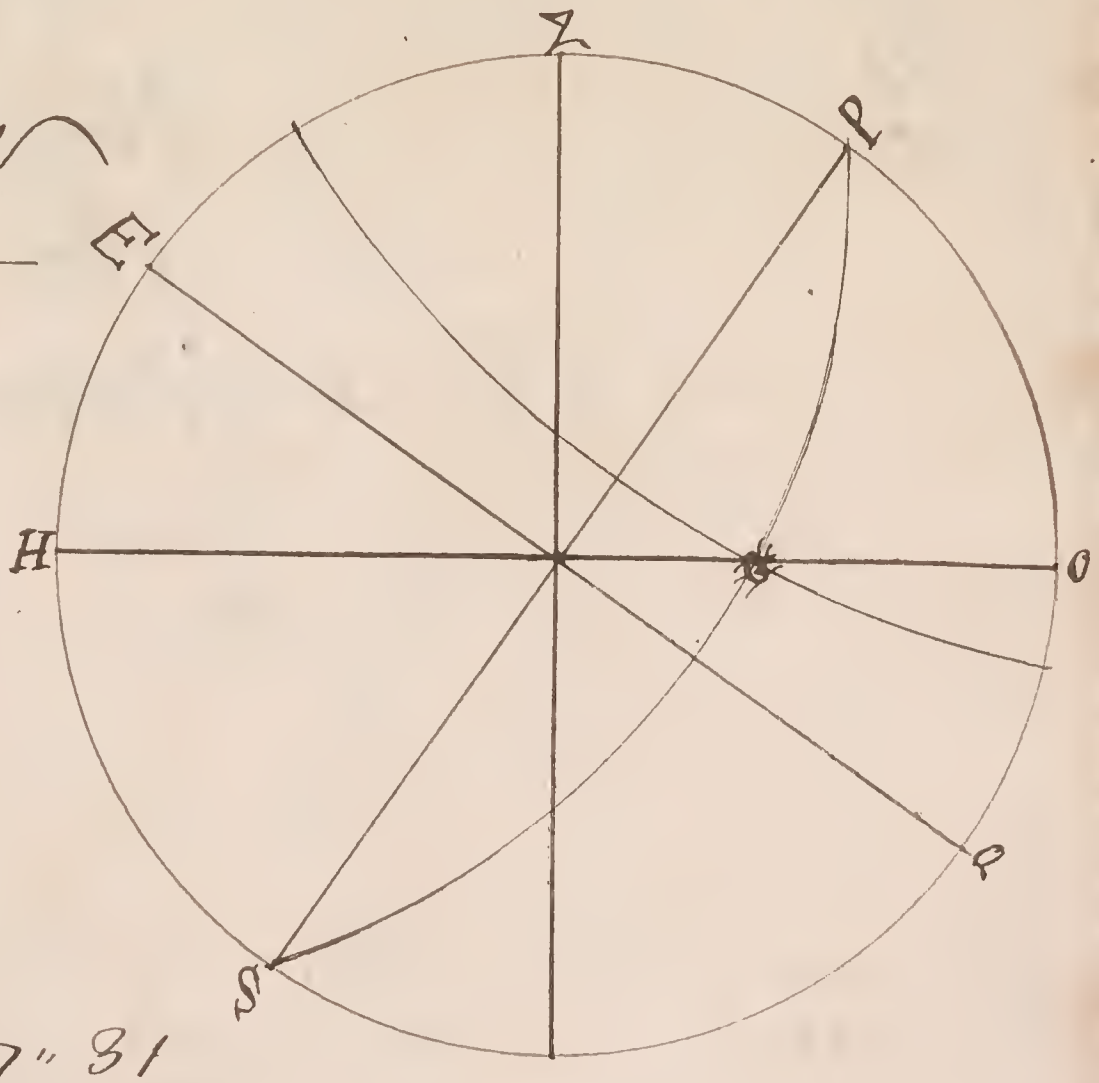
H 15 — H — 25 ° 45′

60
900 | 1545 | 1
900
645
60
900 | 38700 | 43
3600
2700
2700

H m
6 ° 00
1 ° 43
4 ° 17 Sun Rise
7 ° 43 Sun Set
15 ° 26 Length Day
4 ° 17
2
8 ° 34 Length Night

at Whitby I demand the Length of the longest Day and shortest Night

90°.00
Decli. 23°.29 N
∠ Declination 66°.31



As Radius	90°.00	10.0000
So is Sine Decli.	23°.29	9.6379 56
So is Sine Latt.	52°.30	10.1467 32
So is Sine ascensional	37°.31	9.7846 66

15 — 1 — 37°.31

60
900

60
900 | 2251 | 2
1800

451
60
900 | 27060 | 30
2700

60

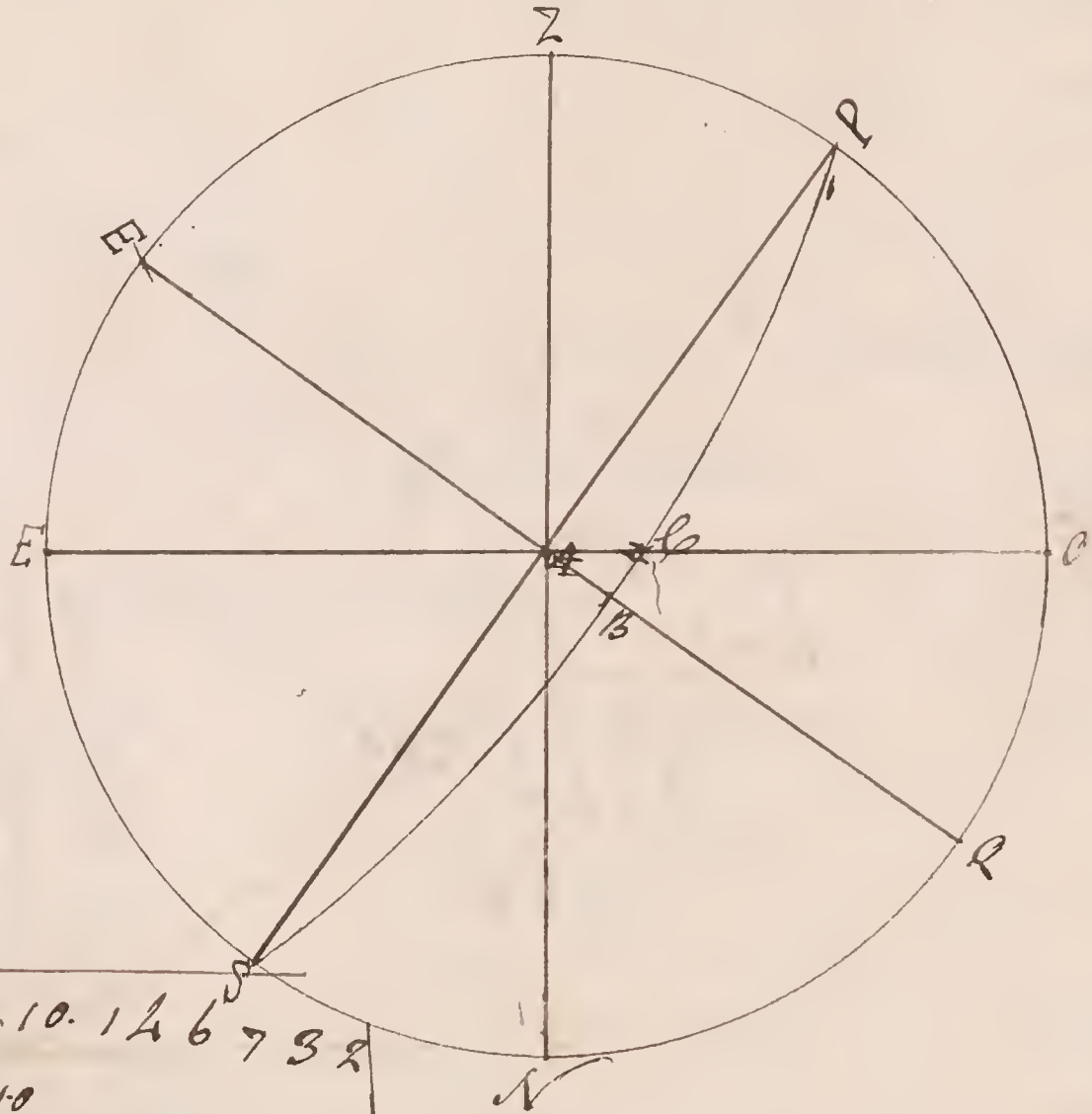
60
6°.00
2°.30
3°.30 Sun Rise
8°.30 Sun Set
2
17°.00 Length Day
3°.30
2
7°.00 Length Night

What two days of the year 1761 will the Sun rise precisely 48 past 4. o. Clock at Whitby

H. M
1 ——— 15 ——— 1 12

60
60

60
72
15
360
72
60 | 1080 | 18
60
480
480

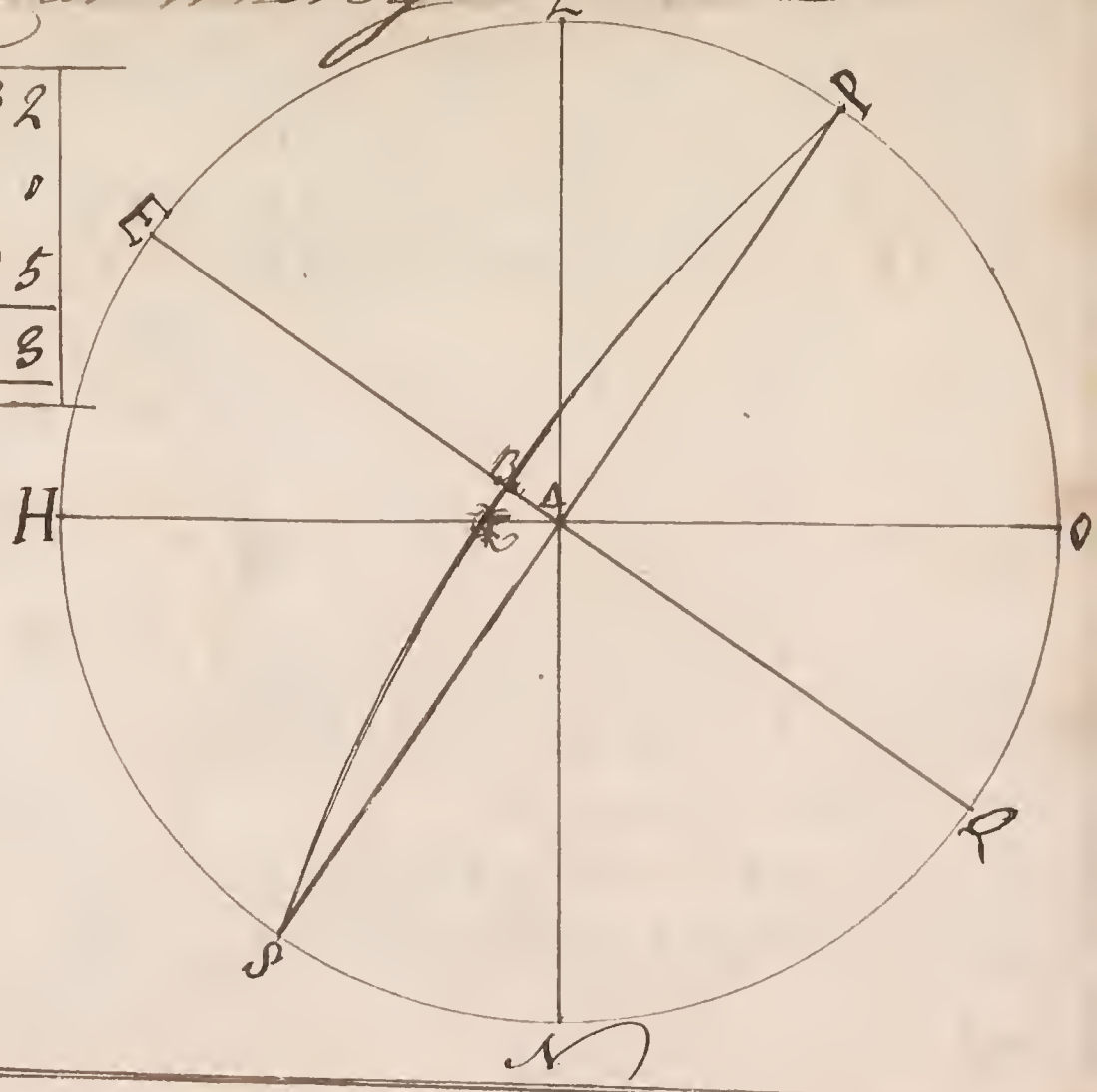


as S L A ..... 54 .. 30 ..... 10. 1466732
S to Radius .. 90 .. 00 10
So is Ascens: ♓ .. 18 .. 00 - 9 4 8 9 9 8 2
S D Decli: .. 12 .. 44 9.34 3250

Answer april 23 and August 19

What two days of the year 1761 does the Sun set precisely at 5-o-Clock at Whitby

as ☽ L A	54° 30	10.	1 4 6 7 3 2
Is to Radius	90° 00	10.	0 0 0 0 0 0
☉ is ☽ ascens:	2ª 15° 00		9 4 1 2 9 9 5
So ☽ ☌ Decli:	10° 28		9 2 6 6 2 6 3

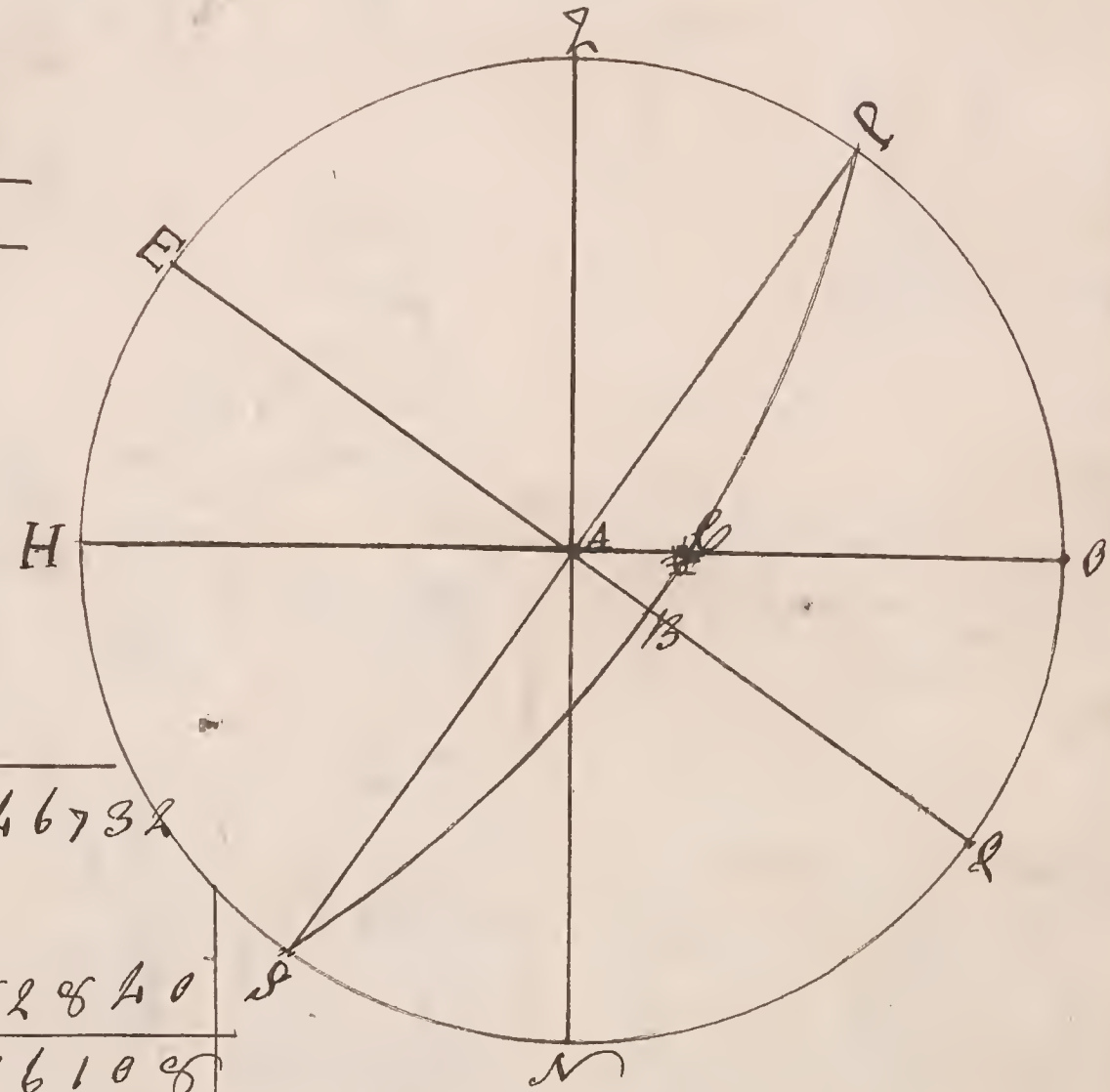


Answer'd Feb.ʳ 21 and Oct.ʳ 20 —

What two Days of the year 1761 are exactly 15 Hours long at Whitby

ʳ/15
7° 30
ascens 22° 30

7° 30
6ª 00
1° 30



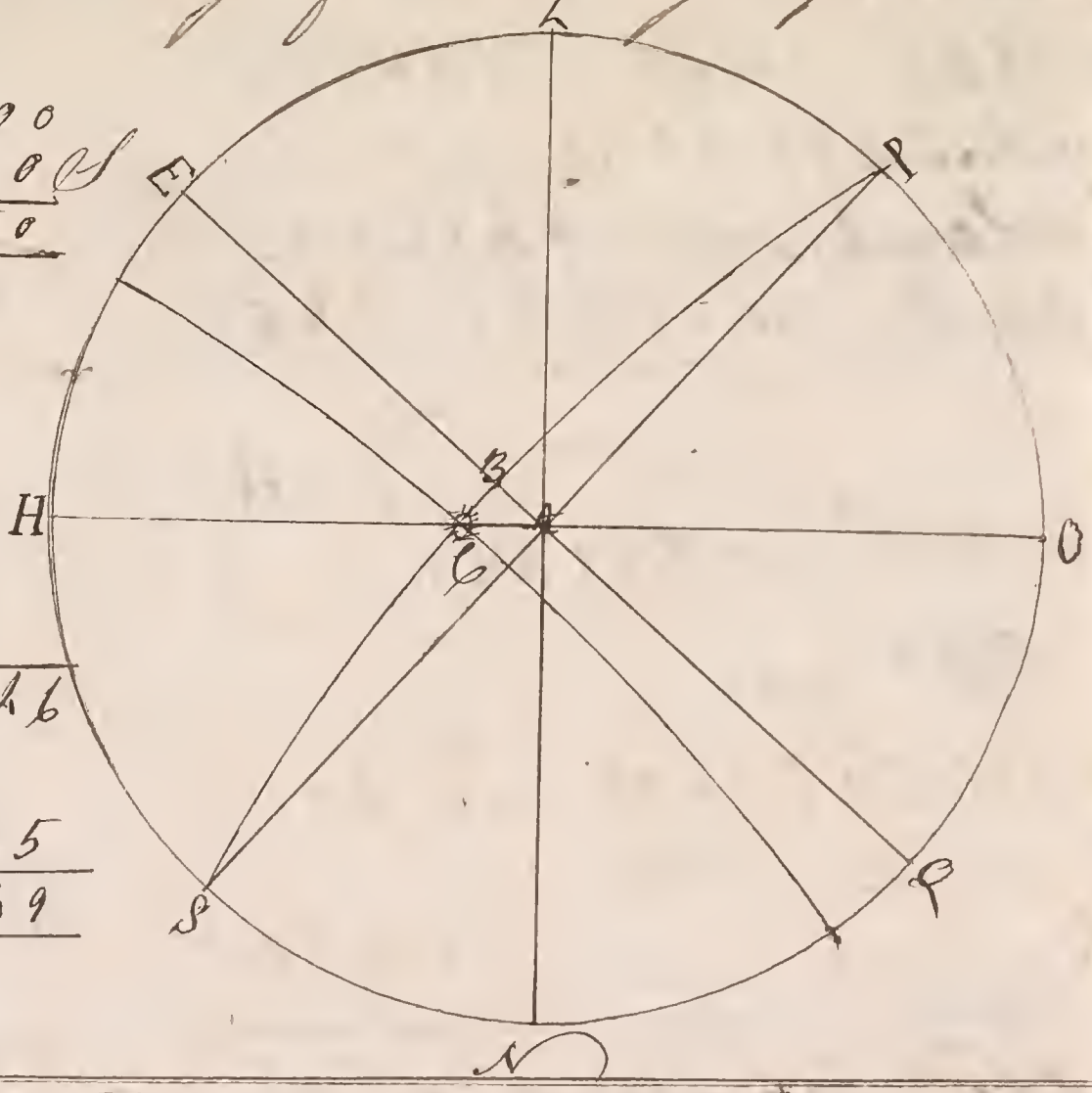
as ☽ L A	54° 30	10.	1 4 6 7 3 2
Is to Radius	90° 00	10	
☉ is ☽ ascens:	22. 30		9. 5 8 2 8 4 0
So ☽ ☌ Decli:	15° 17		9. 4 3 6 1 0 8

Answer'd May 1 and August 11

In what part of the World does the Sun rise exactly at 7. o. Clock this 16th day of February 1761

$\frac{6}{1}$

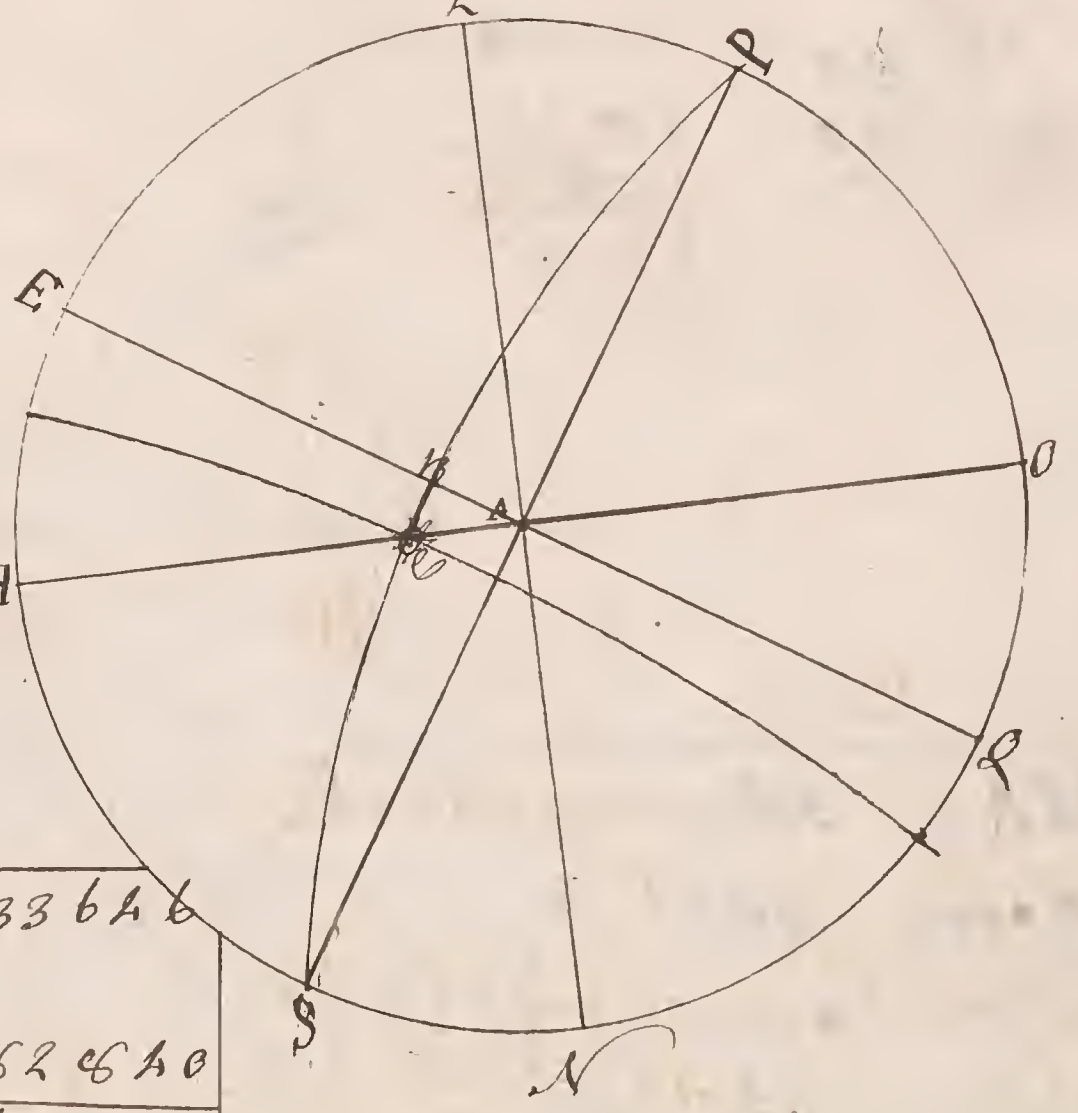
90 ,, 00
Decli: 12 ,, 10 S
☾ Declin: 77 ,, 50



as S. Decli. ..... 12 ,, 10 . 9.333624
S. to Radius ... 90 ,, 0 0 . 10.
S. is S. Ascenl: ☌ 15 ,, 00 . 9. 412995
S. S. ☾ Angle A 39 ,, 46 . 10.079349
90 ,, 00
Latitude in 50 ,, 12 N

In what part of the World is the Day only 9 hours long this 16th day of February 1761

$\frac{9}{2}$
4 ,, 30
6 ,, 00
1 ,, 30
Ascnl: 22 ,, 30 ☌

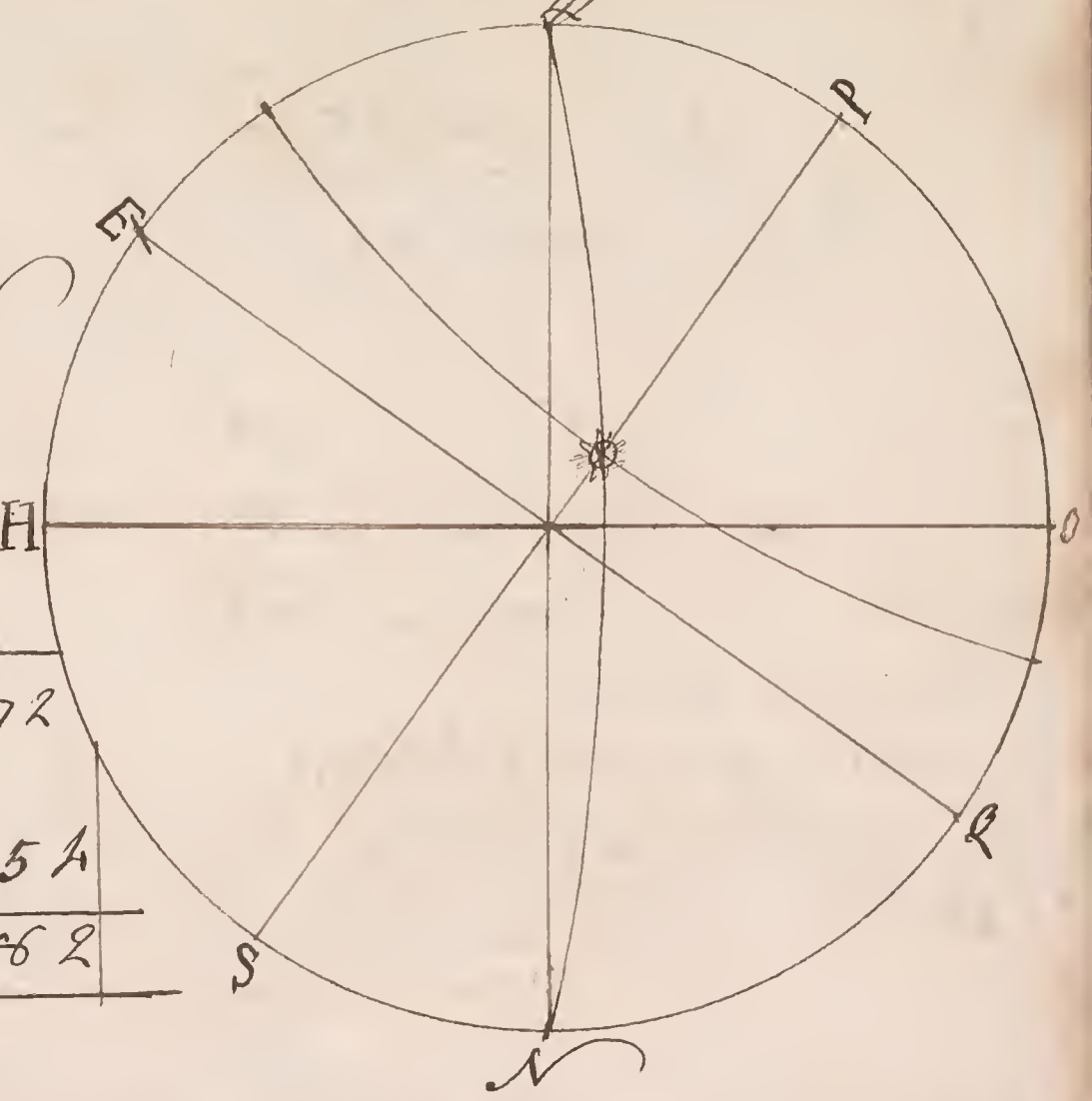


90 ,, 00
Declinasi: 12 ,, 10 S
☾ Declination 77 ,, 50

as S. ☌ Decli. .... 12 ,, 10 . 9333624
S. to Radius .... 90 ,, 00 . 10
S. is S. Ascnl: ☌ . 22 ,, 30 . 9562640
S. S. ☾ Angle A 29 ,, 24 . 10.249194
90 ,, 00
in Latt: 60 ,, 30 N

Prob: 8 To find the Sun's azimuth at the Hour of Six
azimuth is that point of the Compass the Sun &c. is on—
at Whitby May 20th 1761 I dem: the Sun's azimuth at Six

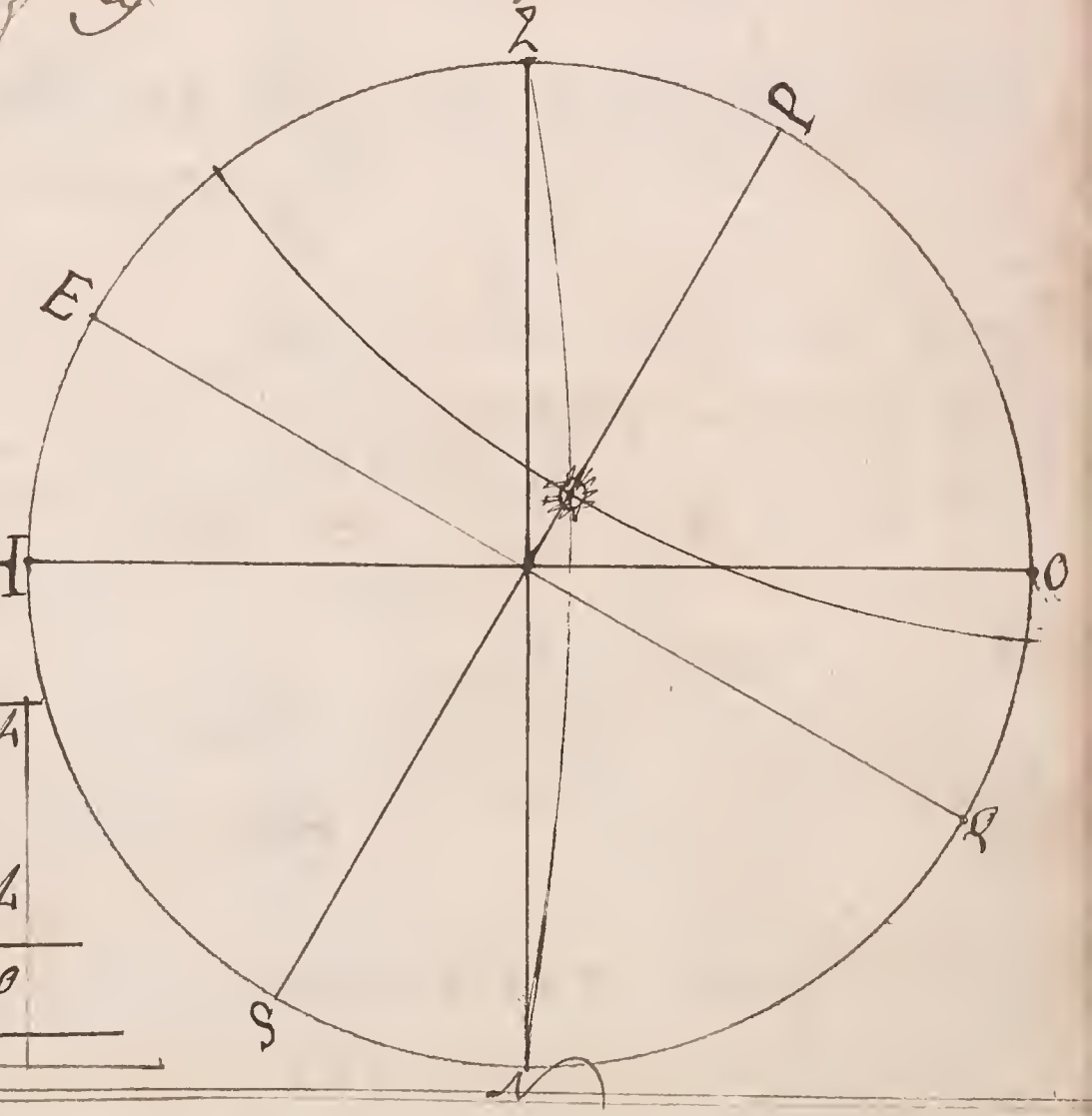
90.00
Declinati: 20.05.N
Co declination 69: 55



As Co Decli: 20.05 .. 10. A 36 972
Is Co Radius .. 90.00 .. 10.
So is Co L A 52.30 .. 9 7 63 95 A
So Is azimuth 11.59 N 9.32 69 62

at North Bergen I demand the Sun's azimuth at Six
when in the Tropick of ♋

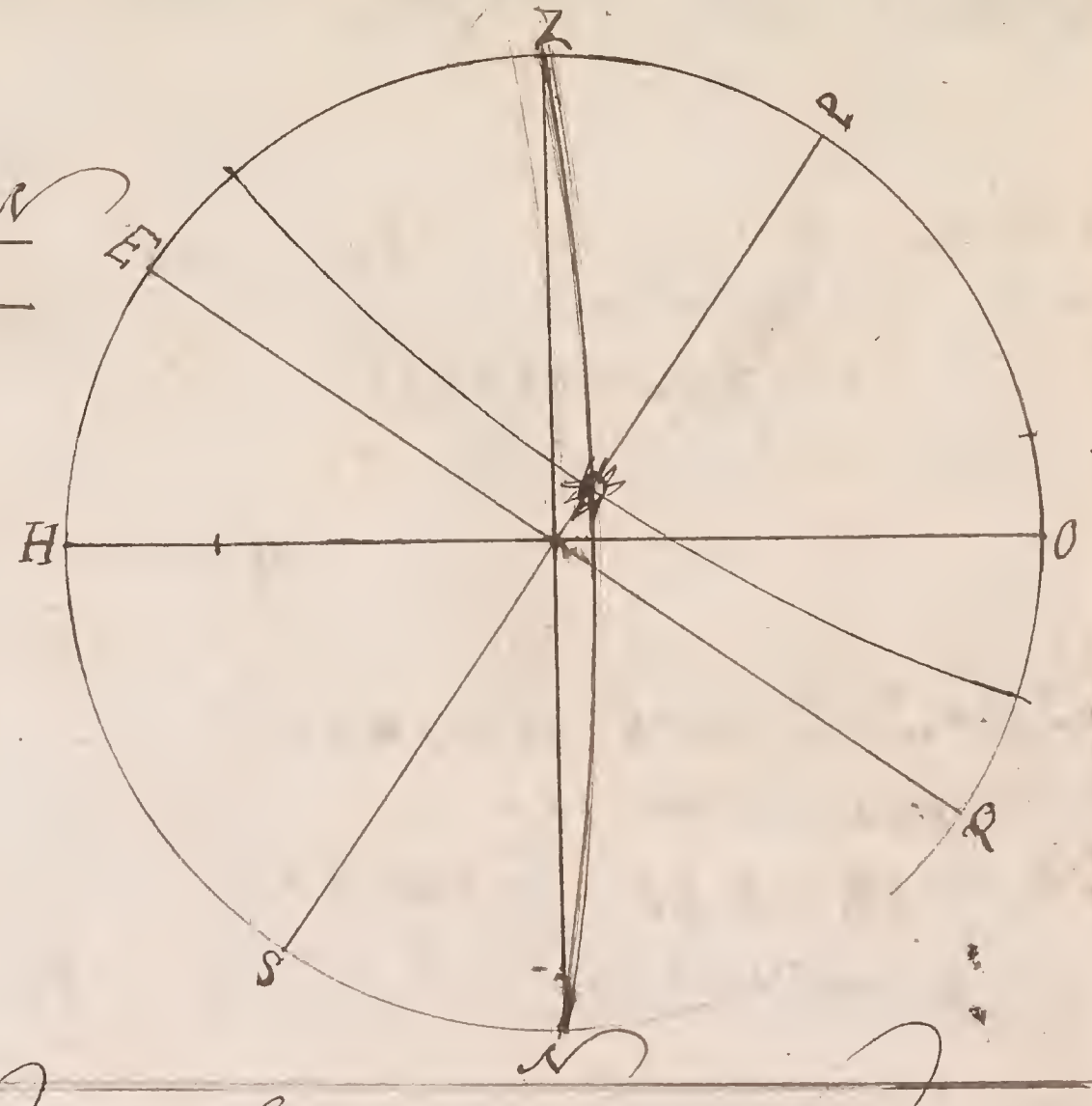
90.00
23.29
66.31



As Co Decli: 23.29 .. 10. 36 20 44
So Co Radius .. 90.00 .. 10. —
So is Co L A bo .. 10 .. 9 69 67 L
So Is azimuth 12.12 L 9.33 L 730

Prob: 9 To find the Suns alt.d at the Hour of Six at Whitby May 1, 1761 I demand the Sun's alt.d at Six

90:00
Declination 15:13 N
Declination 74:47



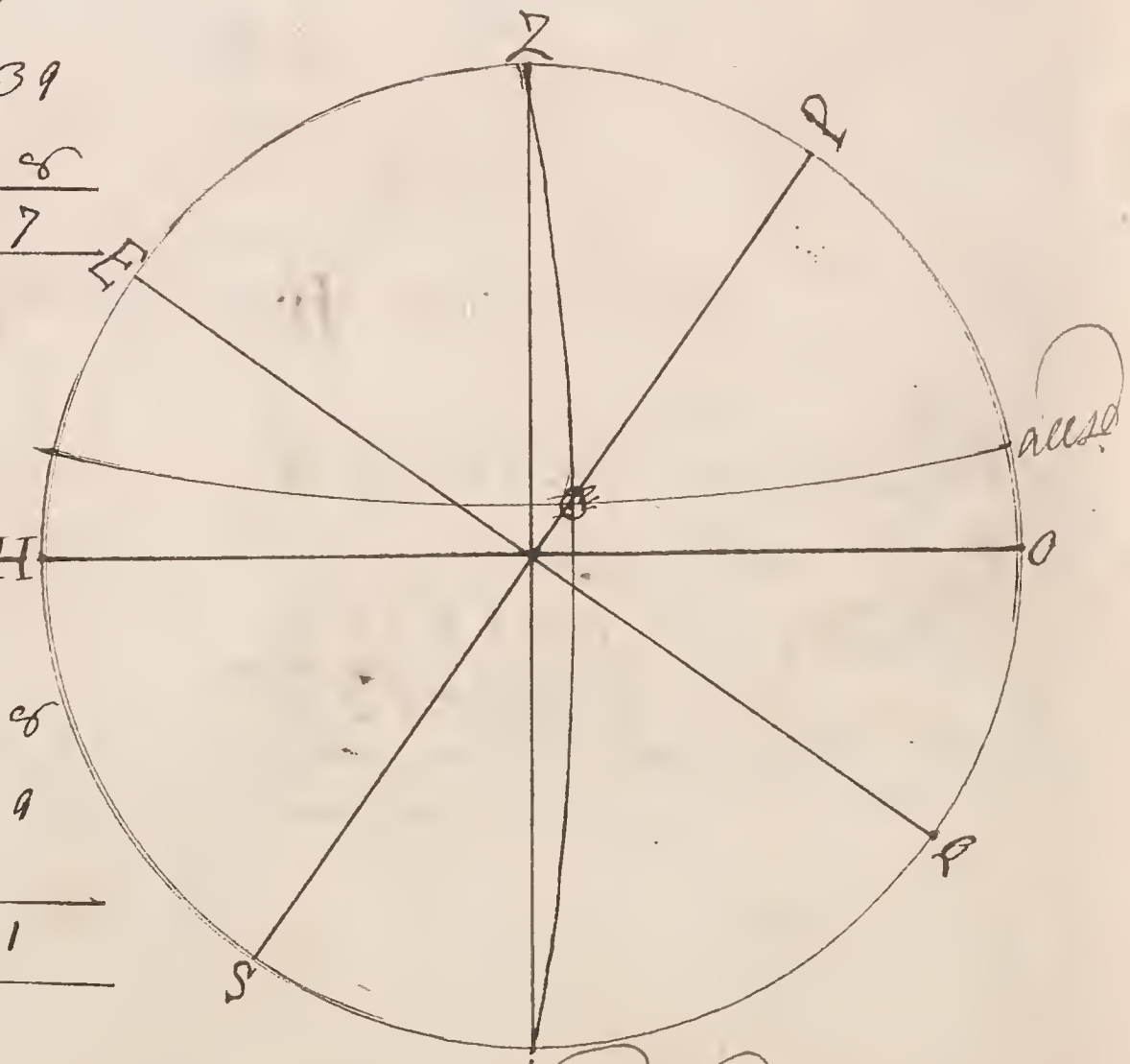
As Radius 90:00 - 10.
To L.o S.n Decli: 15:13 - 9:41907 9
So is S L A. 54:30 - 9:910686
To S.n alt.d 12:20 9:329765

Prob: 10. Given the Latt.d and Suns ~~azimuth~~ alt.d at the Hour of Six; To find his Declination, and Azimuth, at that Time.

at Whitby the Sun's alt.d at Six being 12:20 I demand his Declination & azimuth at that Time

As Radius 90:00 - 10.
To L.o S.n alt.d 12:20 - 9:339739
So is S L angle A 54:30 - 9:910686
To S.n azimuth 65:59 N 9:19 3007

alt.d 90:00
alt.d 12:20
77:40



As S angle A 54:30 - 9:910686
To L.o S.n alt.d 12:20 - 9:329599
So is Radius 90:00 - 10
To S.n Decli: 15:12 N 9:41 8911

The Sun has this Declination May 1 and August 11

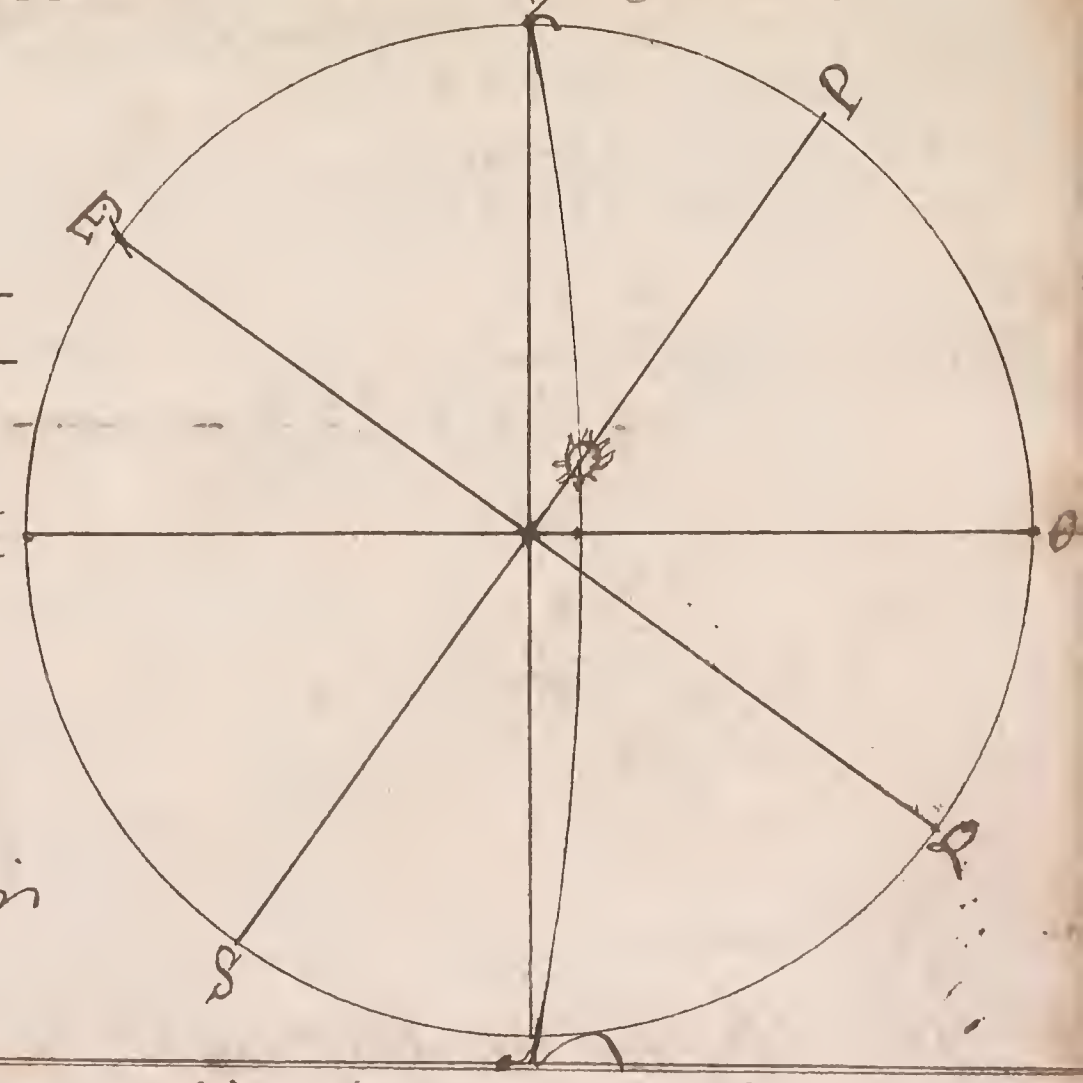
Prob: 11 Given the Latd and Suns azimuth at the Hour of Six; To find his Declination and altitude

at Whitby the Sun's azimuth at Six being ℰ 6 N
I demand his Declination and altitude

as ☉ azimuth 11° 15 - 9.2 9 8 6 6 2
Is Lo Radius - - 90° 00 10
So is ∠ Angle L 54 30 - 9.7 6 3 9 5 4
To ☉ Decli. 10.4 6 5 2 9 2
16° 55 N

as Radius - - 90° 00 - - 10.
Is Lo ☉ Decli: 16° 55 - - 9.5 10 8 0 3
So is ∠ ang le A 54° 30 - 9.9 10 6 8 6
To ☉ alt: 15° 16 9.4 21 4 8 9

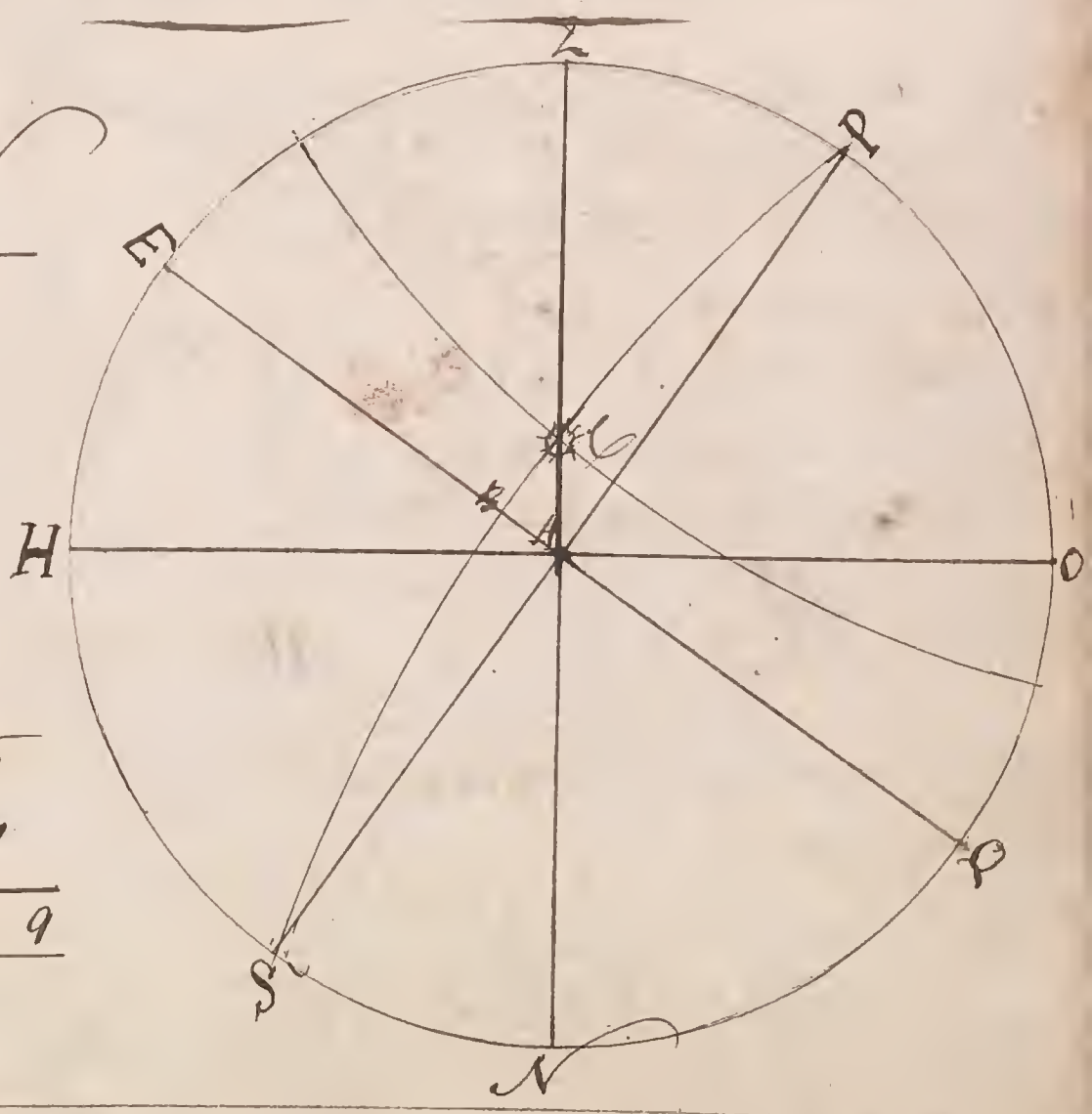
The Sun has this Declination
May 15 and July 29



Prob: 12 To find the Suns altitude when due East and West

at Whitby May 25th 1761 I demand the Sun's Altd when due East & West

90° 00
☉ Declination 21° 03 N
☾ Declination 6 8° 57



as ∠ Angle A 54° 30 - - 9 9 10 6 8 6
Is Lo ☉ Decli: 21° 03 - - 9 5 5 5 3 1 5
So is Radius 90° 00 - - 10. 0 0 0 0 0 0
To ☉ Altd - - 26. 11 - - - 9 6 4 4 6 2 9

Prob: 13 To find the Time of Day when the Sun comes due East or West —

at Whitby June 1, 1761 when will the Sun come due East & West

Decli 90°.00
22°.08 N
Co Declinat 67°.52

as Radius 90°.00 .. 10 .. Co Declinat 67°.52
To Lo Tg LA 54.30 - 9.8532 6.8
So is To Decli 22°.08 - 9.6093 12
To S AB .. 16°.52 - 9.A625 80

If 15 — 1 — 16°.52

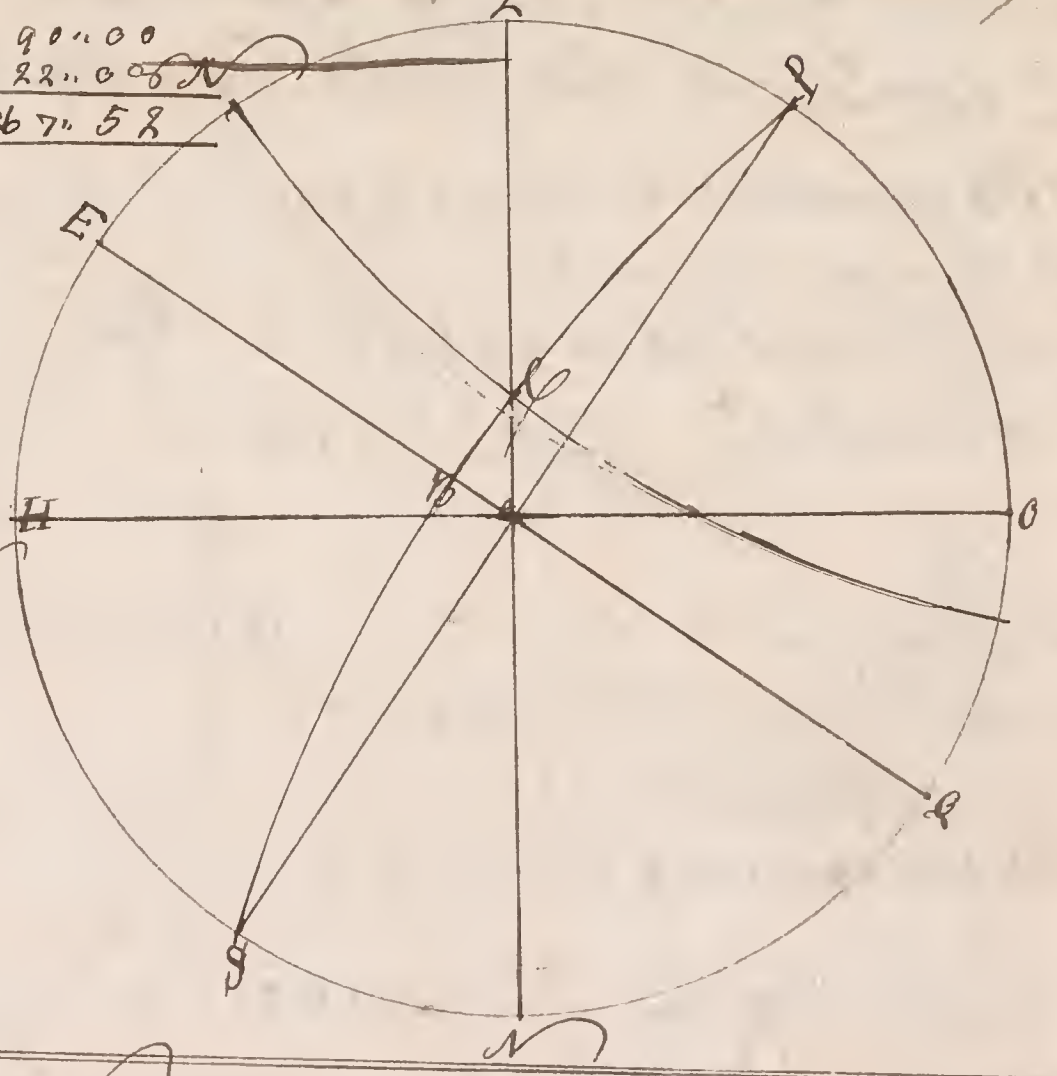
60
900

60 — 60″.00″.00

900 | 1012 | 1″.7″.28 2
900 | 720 | 7′.7″.28 6
112 | A″.52″.32 N

60
900 | 6720 | 7
6300
A20

60
900 | 2520 | 28
1800
7200
7200

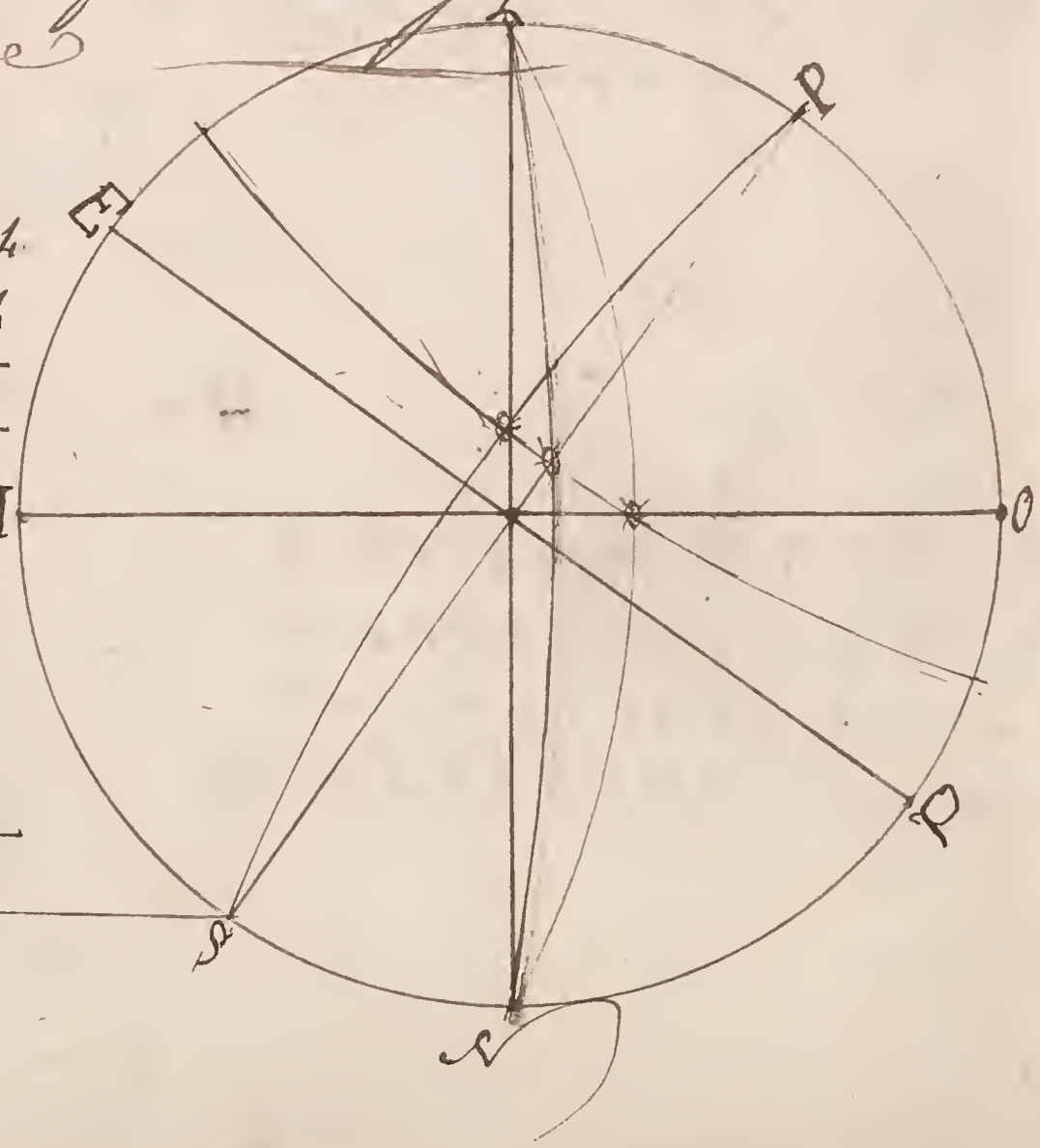


Prob: 14 Given the Latt.e of the place and the Suns ampl.e To find his altt.e and Azimuth at Six; as also the time of his coming due East and his altt.e at that Time with the Time of his Rising and Setting and the Length of the day and Night —

at Whitby the Sun's ampl.e being 28°.50 North I demand as above

as Radius 90°.00 --- 10
To Lo S ampl.e 28°.50 .. 9.6832841
So is S Co Latt.e 54°.30 - 9.7639514
To S Decli. 16°.16 N 9.4472334
90°.00
Co Decli. 73°.44 N

as S Co ampl.e 28°.50 - 10.2592883
To Lo Radius 90°.00 - 10.
So is S Latt.e 54°.30 - 9.9106846
To S Azim.th 42°.04 9.6514253



As Radius ..... 90 00 10.
Is Lo Sx Decli ... 16 16 ... 9.4472386
Lo is Sx Latt. ... 54.30 ... 9.910664
Do Sx Alt. ... 13 10 ... 9.357924
at Sise

As Lo Sx Decli ... 16 16 ... 10.534931
Is Lo Radius ... 90 00 ... 10
Lo is Sx Latt. 54.30 ... 9763954
Do Sx Azimuth ... 9 46 ... 9.224902

As Sx Latt. ... 54 30 ... 9.910664
Is Lo Sx Decli ... 16 16 ... 9.447238
Lo is Radius 90 00 ... 10.
Do Sx Alt. 20 07 ... 9.536552
when due East and West

As Radius ..... 90 00 ... 10.
Is Lo Do Decli. ... 16 16 ... 9.465069
Lo is Sx Latt. 54.30 ... 9.853264
Do Sx Alt ... 12 01 ... 9.318337

// 15 — 1 — 12 01
60
900

60
721
60
900 | 43260 | 48
3600
7260
7200
60
60
900 | 3600 | 4
3600
. . .

// 15 — 1 — 24.00
60
900 | 1440 | 1
900
540
60
900 | 32400 | 36
2700
5400
5400
. . .
60
900 | 24000 | 32
2700
1500
1500
. . .

6 00 00
1 36 32
7 36 32 Sun Set
4 23 28 Sun Rise
2
9 46 56 Length Night
7 36 32
2
15 13 04 Length Day

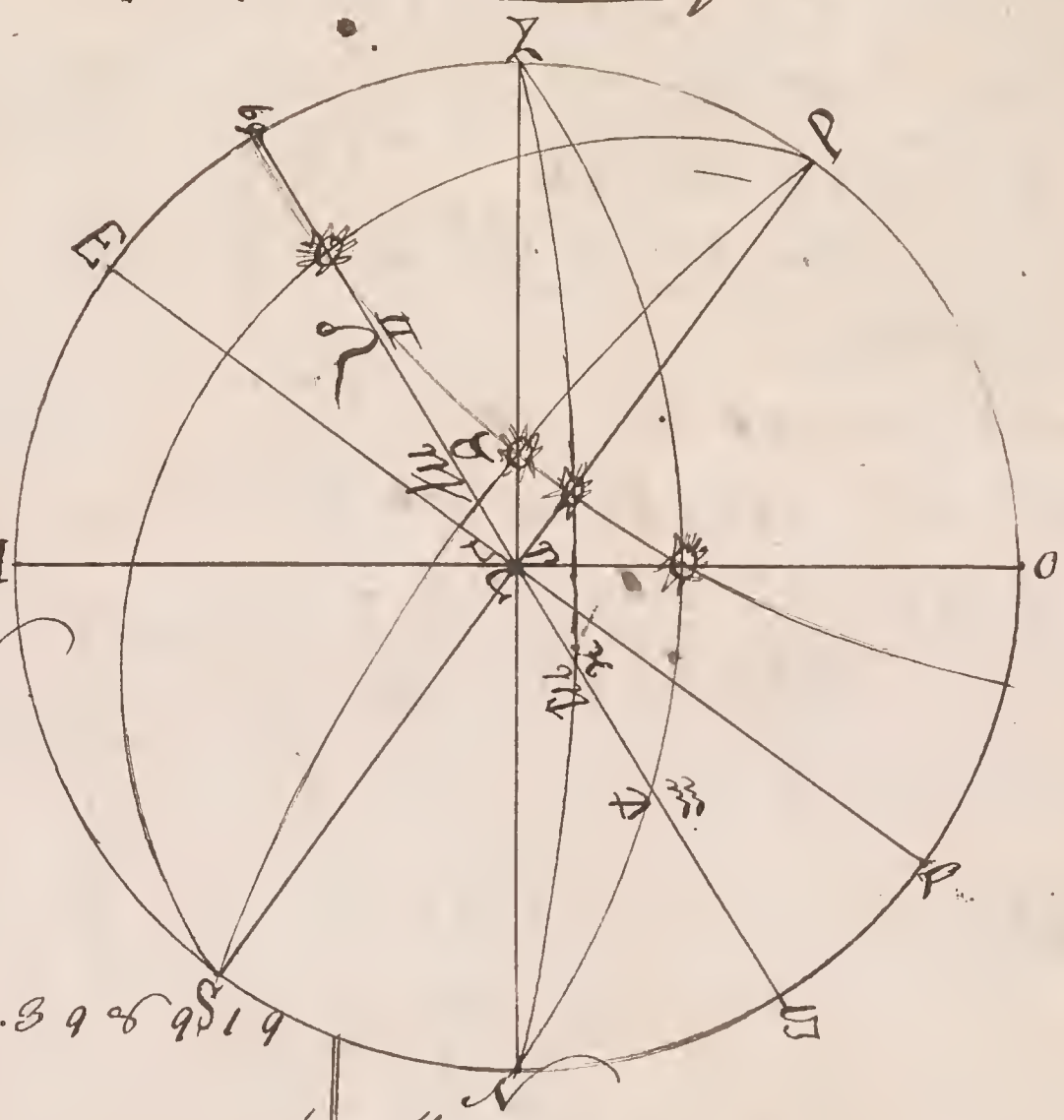
6 00 00
0 48 04
6 48 04 East
5 11 56 West

Prob: 15 Given the Latt^d of the place and Suns azimuth at the Hour of Six: To find his altt^d at that Time: his Declination: his Right Ascension: his Ampl^d: his altt^d when due East and West: the Time of his being on the Prime Vertical: the Time of his Rising and Setting: with the Length of the Day and Night

At Whitby the Sun's azimuth at Six being E N 25 3/4 I demand as above.

☼ azimuth 90° 00
14° 04
☾ azimuth 75° 56

Latitude 90° 00
54° 30
☾ Latitude 55° 30



Declination 90° 00
23° 20 N
☾ Declination 6° 40

as I☼ azimuth -- 14° 0' ---- 9.39 96 918
Is Lo Radius -- 90° 00 --- 10
So is S☾ Latt^d -- 54° 30 ---- 9.763954
So I☼ Decli -- 23° 20 ---- 10.36 50 35

as Radius ---- 90° 00 --- 10.
Is Lo I☼ Decli -- 23° 20 ---- 9.59773 96 3
So is S Latt^d -- 54° 30 --- 9.91066 96
So I☼ alt^d --- 18° 49 -- 9.50 96 469
at Six

as Radius ---- 90° 00 --- 10.
Is Lo I Latt^d --- 54° 30 --- 10.14 67 32
So is I☼ Decli 23° 20 --- 9.63 46 38 96
So I☼ ascen^n 37° 12 N 9.7961570

as S☾ Latt^d ---- 54° 30 -- 9.763954
Is Lo I☼ Decli -- 23° 20 -- 9.59773 96 3
So is Radius -- 90° 00 -- 10
So I☼ ampl^d 23° 00 -- 9.7961570

15 — 1 — 37° 12
60
900 | 2232 | 2
1800
432
60
900 | 25920 | 28
1800
7920
7200
720
60
900 | 43200 | 48
36 00
7200
7201

6° 00° 00
2° 28° 48
3° 31° 12 Sun Set
2
7° 02° 24 Length Night
2
16° 57° 36 Length Day

as S Latd ------ 54.30 -- 9.910686
Jo Lo S☉ Decli: --23.20 -- 9.597763
So is Radius -- 90.00 -- 10
Jo S☉ altd ---29.07 -- 9.686097
when due East and West

as Radius ------ 90.00 --- 10
Jo Lo I☉ Decli: --- 23.29 -- 9.634636
So is I☉ Latd --- 54.30 -- 9.763954
Jo I☉ alt ---- 14.31 - 9.398792

as Radius ------ 90.00 --- 10.
Jo Lo I☉ Decli: 23.20 --- 9.634636
So is I☉ Decli: plac: 23.29 -- 10.362044
Jo I☉ Right Ascen: 63.09 - 9.996662
160.00
☉ Right Ascension 6.51

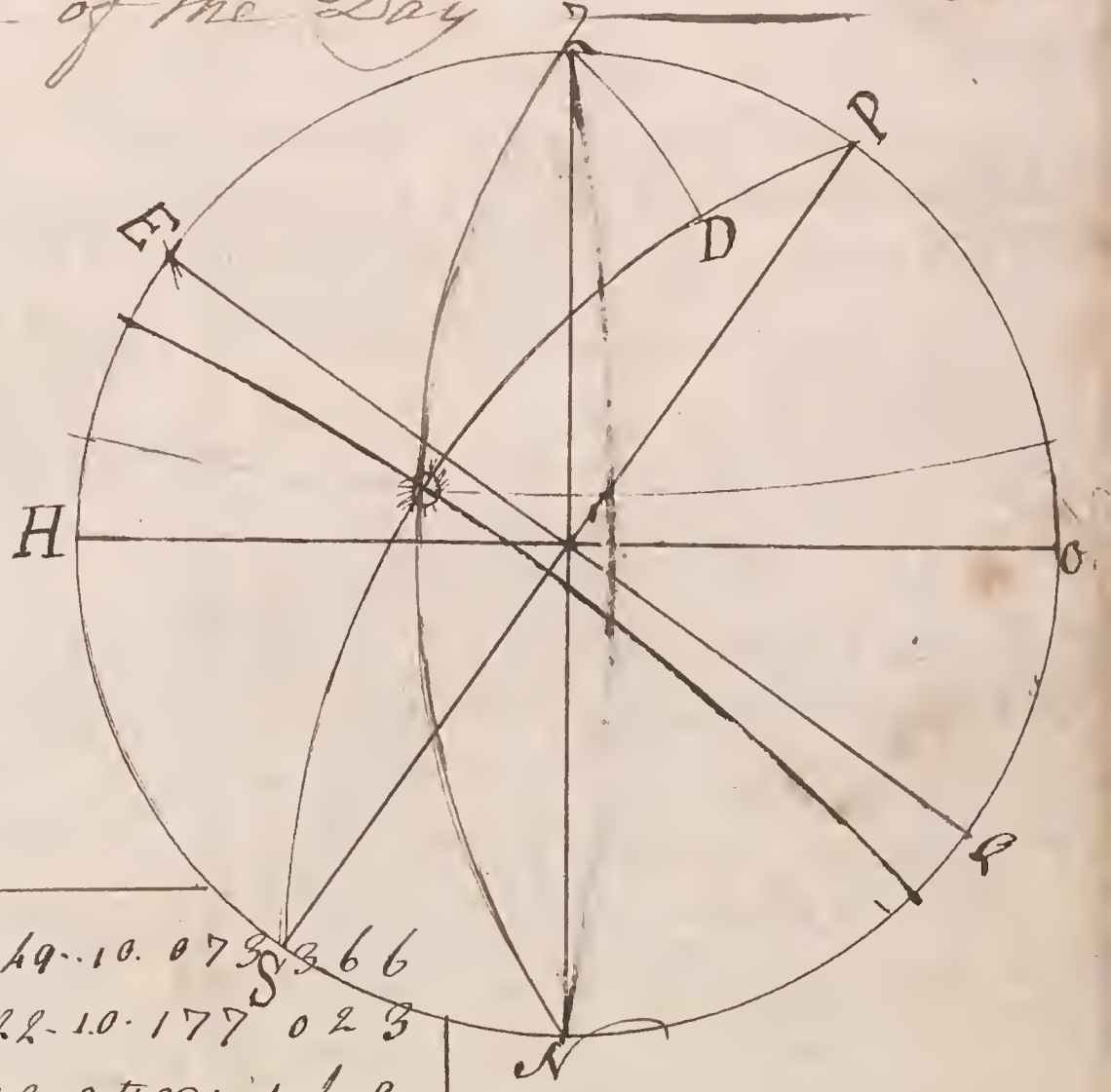
15 / 60 / 900 ——— 1 ——— 14.31
60
871
60
900 | 52260 | 58
4500
7260
7200
60
60
900 | 3600 | 4
36 00

6.00.00
0 56.04
6.56.04 East
5.01.56 West

Prob 16 Given the Latd Suns Declination and altd; To find his azimuth and the Hour of the Day ——

At Whitby February 23. 1761 the Sun's altitude in the Forenoon being 12:45 I demand his azimuth and the Hour of the Day ——

Declination 99.30
49.49
35:30
77.15
112.45
56.22
41.45
20.52



as Jof ☐ the Base ------ 49.49 -- 10. 075366
Jo Log of Jof ☐ the Sum of y other 2 Sides 56.22 - 10. 177023
So is the Jof ☐ their x ---- 20.52 - 9.561149
Jo the Jof ☐ of x of the Seg: of y Base ... 19.738172
9.646406
25.50
49.49
AD 75:39
DP 23.59

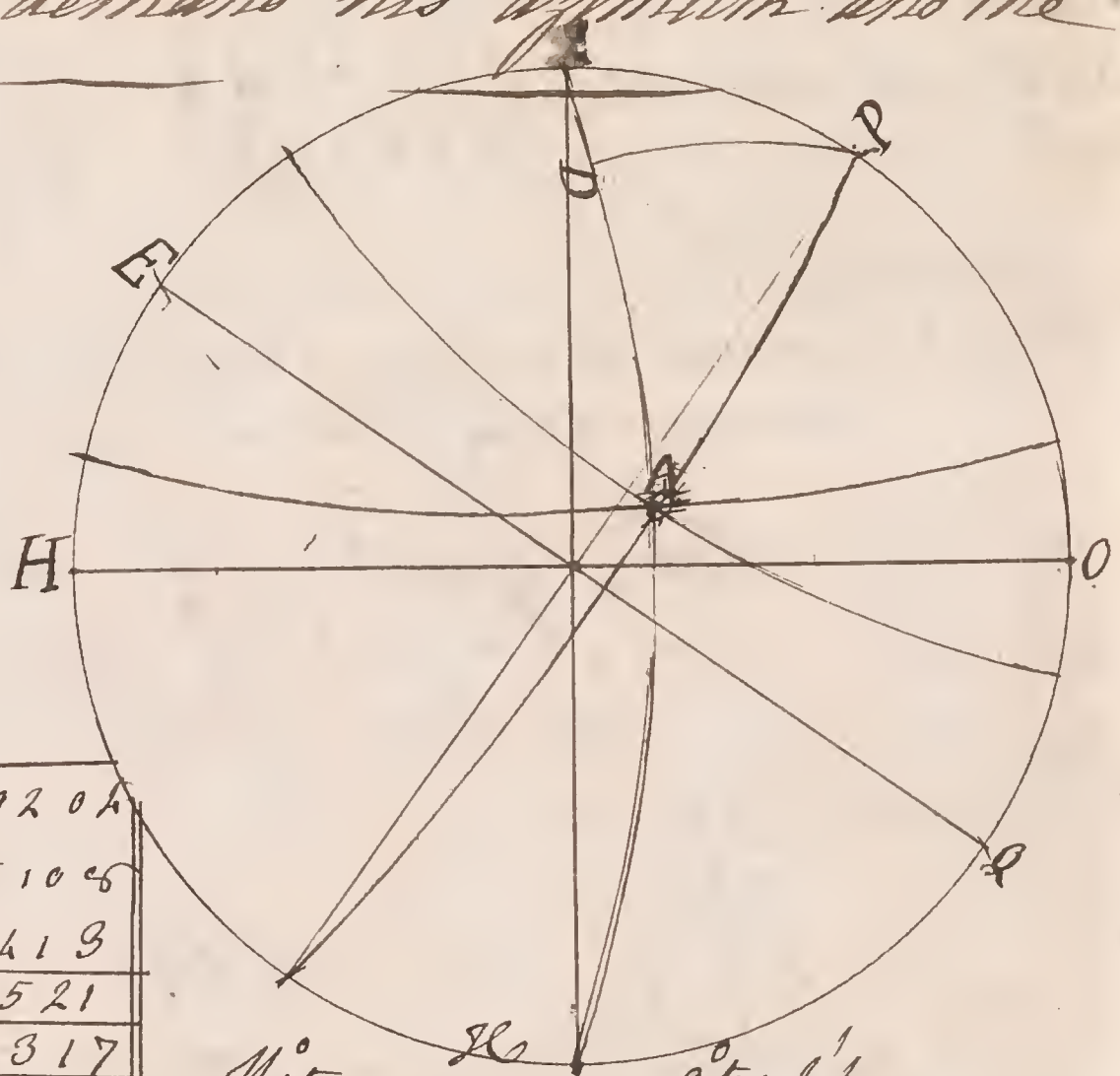
as Radius	90° 0.0	10
To Lat	54° 30	10.1464732
So is DP	23° 29	9.6090229
To ∠ Angle P	55° 15	9.9155761
as Alt°	75° 15	9.9669157
To SP	55° 15	9.9146865
So is Decli	40° 22	9.9934632
To ∠ angle Z	56° 09	9.9068517
azimuth is SZ		9.9193600

$$\frac{\text{Sin } 55^\circ 15' \times 1}{60 \times 900} = 55' 15'' \qquad 900 \overline{)3315}\,3 \quad 2700 \quad 615 \quad 60 \quad 900 \overline{)36900}\,41 \quad 3600 \quad 900 \quad 900$$

h	m
12	00
3	41
8	19

at Whitby May 30th 1761 the Sun's Alt° in the afternoon being 14°: 20' I demand his azimuth and the Hour of the Day

$$\frac{75^\circ 40}{2} \quad 37^\circ 50 \quad 68^\circ 13 \quad 35^\circ 31 \quad \frac{103^\circ 44}{2} \quad 51^\circ 52 \quad \frac{32^\circ 44}{2} \quad 16^\circ 21$$



as Sin of Base	37° 50	9.7869204
To Log Sin of Sum of 4th: 2 S	51° 52	10.1051086
So is the Sin of their ∠	16° 21	9.4467413
To Sin of 2 of Leg: of Base	25° 42	9.5725521
		9.6862317

$$\frac{\text{Sin } 95^\circ 44' \times 1}{60 \times 900} = 95' 44'' \qquad 900 \overline{)57444}\,6 \quad 5400 \quad 344 \quad 60 \quad 900 \overline{)20640}\,22 \quad 1800 \quad 2640 \quad 1800 \quad 840 \quad 60 \quad 900 \overline{)50400}\,56 \quad 4500 \quad 5400 \quad 5400$$

A	25° 42	
	37° 50	
Z D	63° 32	
	12° 06	
as Radius	90° 00	10
To Lat	54° 29	10.1464865
So is Z D	12° 06	9.3322418
To ∠ angle Z	72° 29 WNW½W	9.4786663
as Sin Decli	66° 13	9.9667426
To Sin angle Z	72° 29	9.9779360
So is Alt°	75° 40	9.9862666
To ∠ Angle P	84° 16	9.9655646
	180° 00	9.9978420
	95° 44	

No more work that

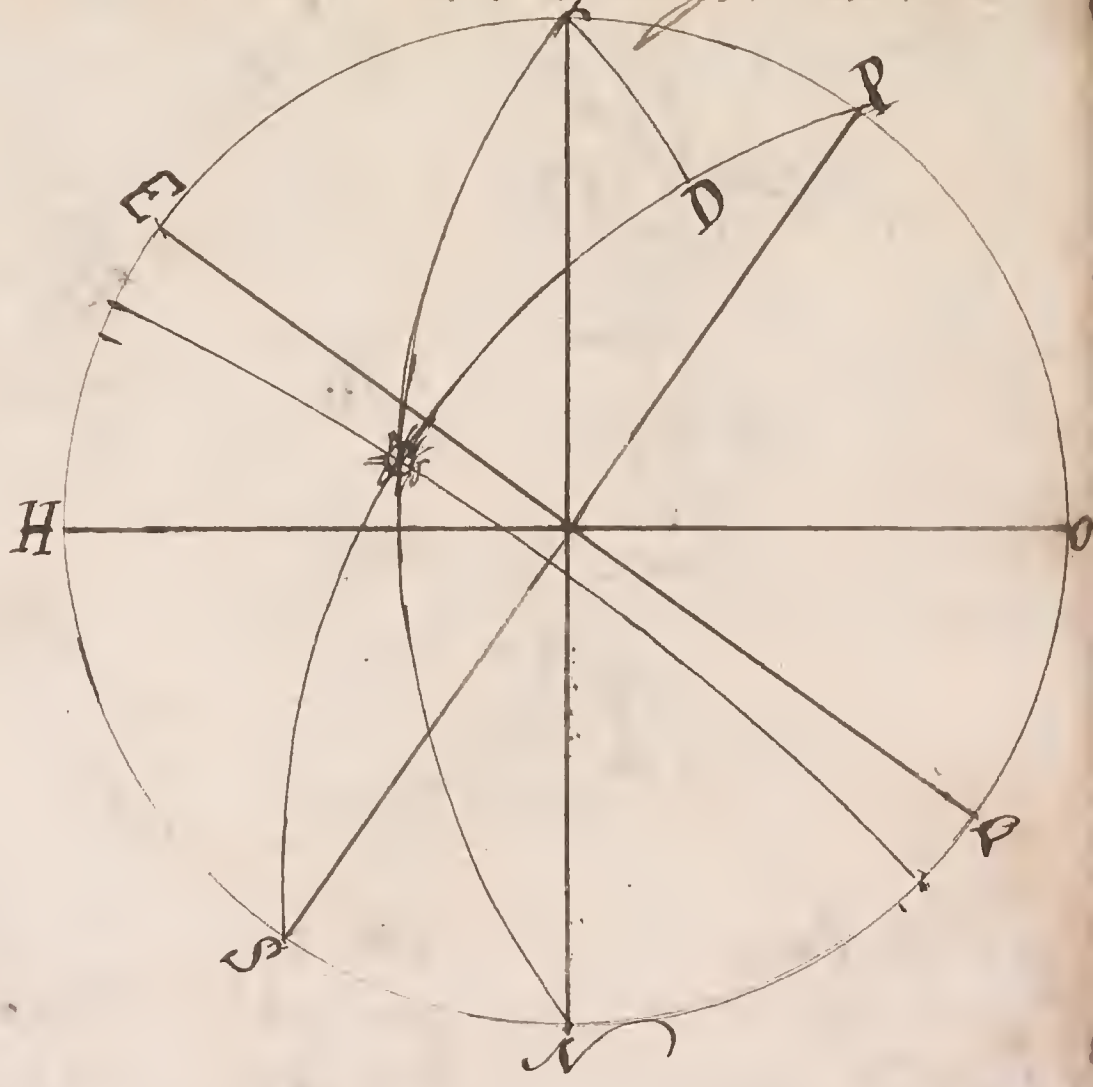
Prob: 17 Given the Latt. & Suns Declination and hour of the Day To find his altt and azimuth at that time

at Whitby February 24th 1761 at 21 past 3 in the afternoon I demand the Sun's altt. & azimuth

6..00
3..21
2..39

11 — 15 —— 2..39

60 | 60
60 | 159
15
795
159
60 | 2365 | 39
160
565
540
45
60
60 | 2700 | 45
240
300
300

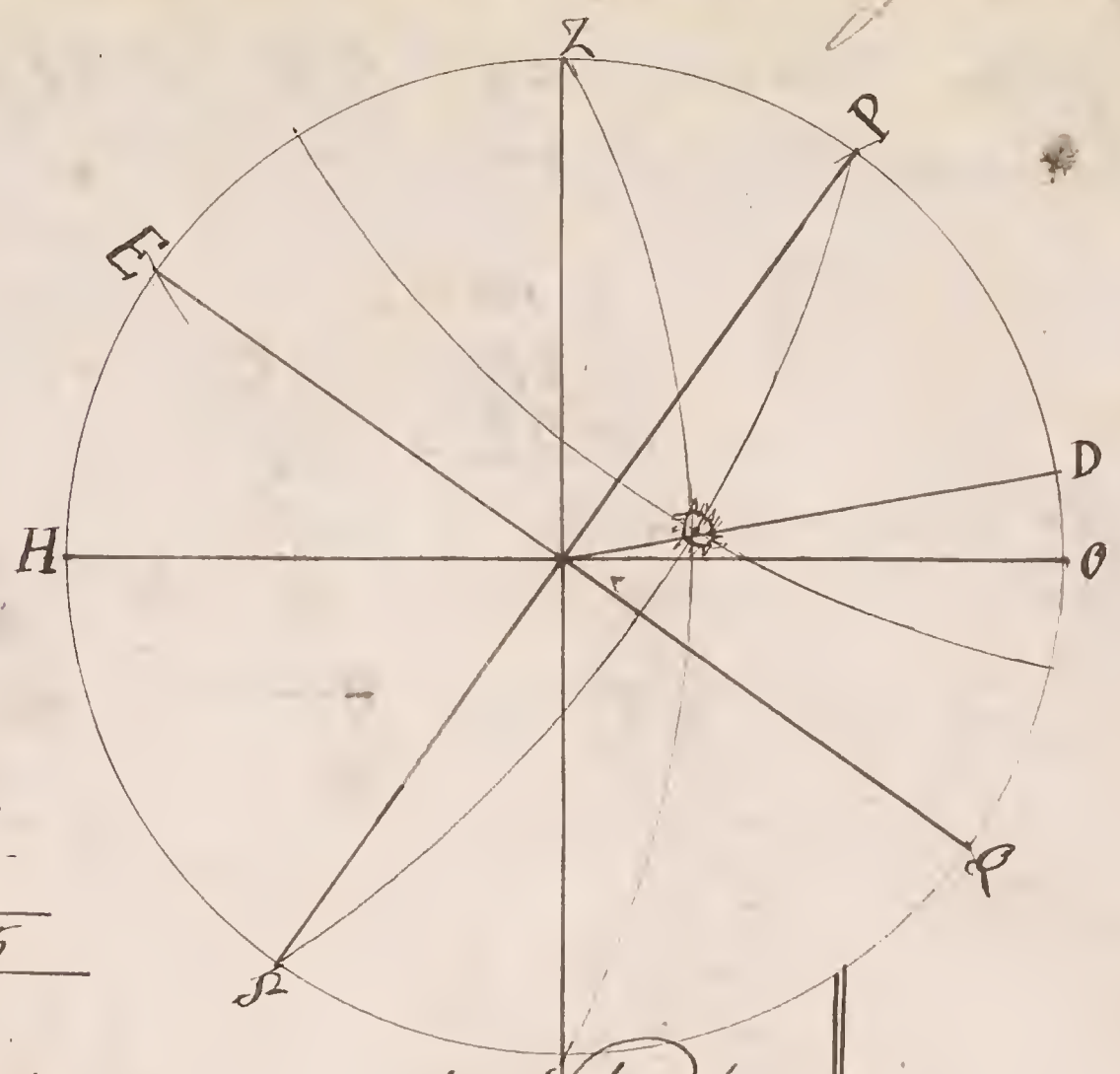


as S Latt ----------	54..30 ----------	10. 14 6732
So to Radius ----------	90..00 ----------	10.
So is S Angle P ----------	50..15 ----------	9.8057 99
So is S P D ----------	24..31 ----------	9.6590 67
	AD 99..17 / 74..46	
as Radius ----------	90..00 ----------	10.
So to S Latt ----------	54..30 ----------	9.7639 54
So is S Angle P ----------	50..15 ----------	9 8 6 5 8 37
So is S D Z ----------	26..31 ----------	9.6497 91
as Radius ----------	90..00 ----------	10.
So to S Angle A ----------	74..46 ----------	9.9195 44
So is S D Z ----------	26..31 ----------	9.9517 28
So is S A Z ----------	76..24 ----------	9 3 7 1 2 7 2
as Side A Z ----------	76..24 ----------	9.9 8 7 6 4 9
So to S Angle P ----------	50..15 ----------	9 8 6 5 8 37
So is Side A ----------	80..43 ----------	9 9 9 4 2 7 4
So Angle Z ----------	51..19 ----------	9 8 6 0 1 11
	180..00	9.8 9 2 4 6 2
angle Z	128..41	

At Whitby July 1, 1761 at 35 past 4 in the Morning I demand the Suns Altitude and Azimuth

// 1 — 15 — 1.25
60 60
60 65
15
425
65
60 | 12 75 | 21
120
75
60
15
60
60 | 900 | 15
60
300
300

40.00
L P 21.15
L P 66.45



as S C P# ---------- 66.52 ---------- 9.6 3 8 6 5 6
S to R dius ---------- 90.00 ---------- 10
So is S C angle P ---------- 66.45 ---------- 9.5 5 9 2 3 4
So S D P ---------- 40.15 ---------- 9.9 2 6 5 7 6

P Z 35.30
D Z 75.45

as Radius ---------- 90.00 ---------- 10.
S to side P# ---------- 66.52 ---------- 9.9 6 3 5 9 6
So is S angle P ---------- 66.45 ---------- 9.9 6 9 4 2 0
So side D# ---------- 59.00 ---------- 9.9 3 3 0 1 6

C as Radius ---------- 90.00 ---------- 10.
S to S C D Z ---------- 75.45 ---------- 9.3 6 9 7 1 1
So is S C D# ---------- 59.00 ---------- 9.7 1 1 6 3 9
So S C Z# ---------- 62.45 ---------- 9.1 0 1 5 5 0

as S D# ---------- 59.00 ---------- 10. 2 2 1 2 2 6
S to Radius ---------- 90.00 ---------- 10
So is S D Z ---------- 75.45 ---------- 9 9 6 6 5 2 3
So S C angle Z ---------- 59.47 ---------- 9.7 6 5 2 9 7

Azimuth N 30 E 1/2 C

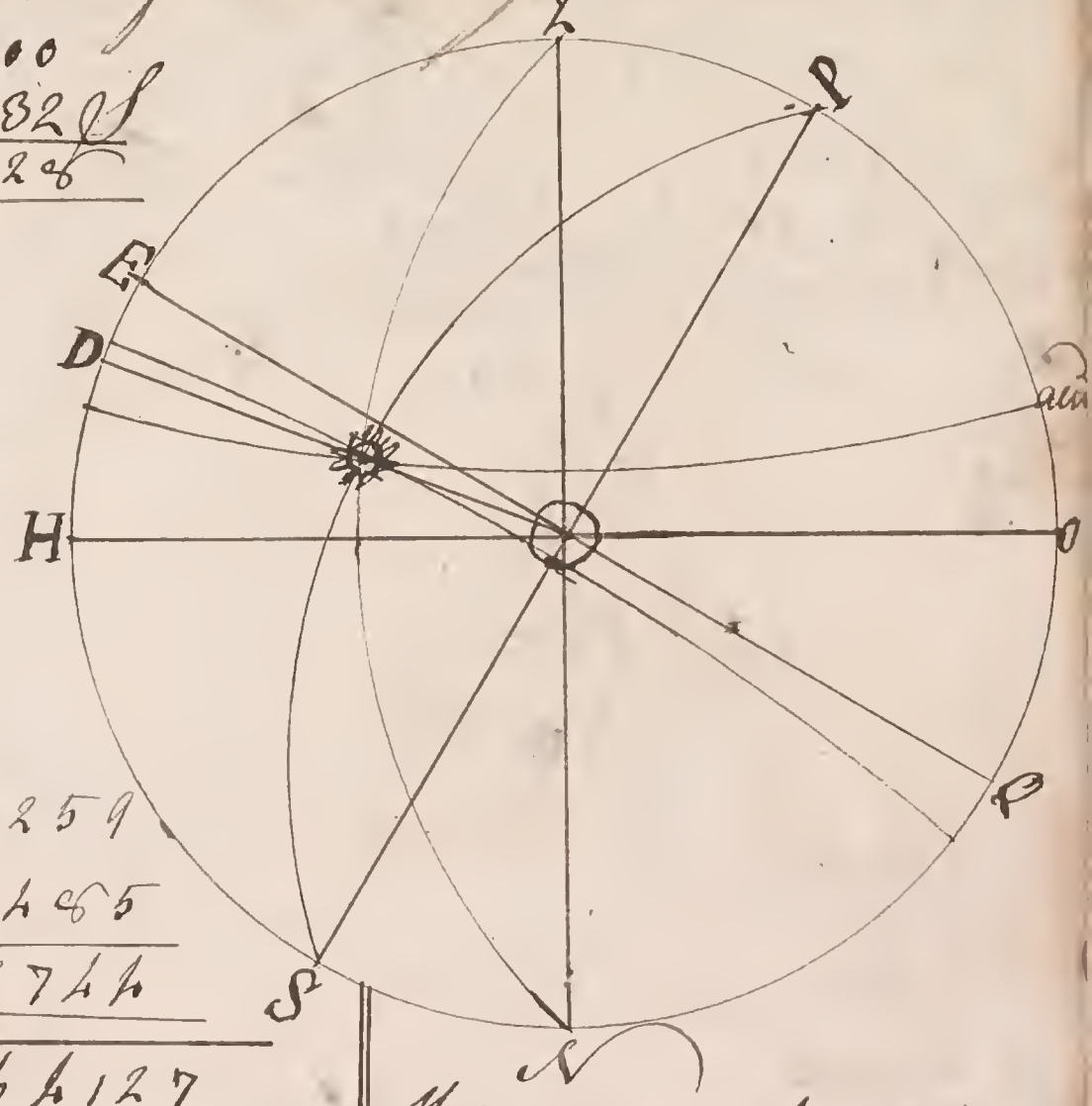
Prob 18 — Given the Suns Declination altd and azimuth. to find the Latitude and hour of the Day

February 26th 1761 the Sun's altd in the afternoon being 15° 20' when his azimuth is SW & Demand the Lat. in and Hour of the Day

90° 00'
altd 15° 20'
Calt 74° 40'

90° 00'
Decli 6° 32' S
C Decli 81° 28'

90° 00'
6° 32'
96° 32'
180° 00'
81° 28'



As Radius - - - 90° 00' - - - - - 10.
Js Lo Salt - 74° 40' - - - - - 9.9 8 4 2 5 9
Jo is Angle Z - 45° 00' - - - 9.8 4 9 4 8 5
Jo Side DO - 43° 00' - - - 9.8 3 3 7 4 4

As Sine DO - - - 43° 00' - - - 9.8 6 4 1 2 7
Js Lo Radius - - - 90° 00' - - 10.
Jo is Sine PO - - 81° 28' - - 9.1 7 1 3 8 9
Jo Sine PD - - 78° 18' - - 9.3 0 7 4 6 2

As Sine Calt. - - - 74° 40' - - - 9.4 3 8 0 5 9
Js Lo Radius - - 90° 00' - - 10.
Jo is Sine Angle Z - - 45° 00' - 9 8 4 9 4 8 5
Jo Sine DZ - - - - 68° 53' - 10.4 1 1 3 2 6

As Side PO - - - 81° 28' - - 9.9 9 5 1 8 4
Js Lo Sine Angle Z - - - 45° 00' - 9.8 4 9 4 8 5
Jo is Side ZO - - - 74° 40' - - 9.9 8 4 2 5 9
Jo Sine Angle P - - - 43° 36' - 9.8 3 3 7 4 4
9 8 3 8 5 6 9

180° 00'
PD 78° 18'
101° 42'
PZ 68° 53'
32° 49'
Latitud 90° 00'
57° 11' N

15 — 1 — 43° 36'

60
900 | 2616 | 2
1800
816
60
900 | 48960 | 54'
4500
3960
3600
360
60
900 | 21600 | 24'
1800
3600
3600

2h 54' 24" afternoon

Prob. 19 Given the Suns Declination altt. and hour of the Day To find his azimuth and the Latitude in

May 20th 1761 at 16 past 4 in the afternoon the Suns altt. being 27°. 40' I demand his azimuth & the Latitude in

6 ... 00
4 ... 16
1 ... 44

90 ... 00
altt 27 ... 40 Decli: 20 ... 05 N
ℓ altt 62 ... 20 ☉ Decli: 6 ... 55 N

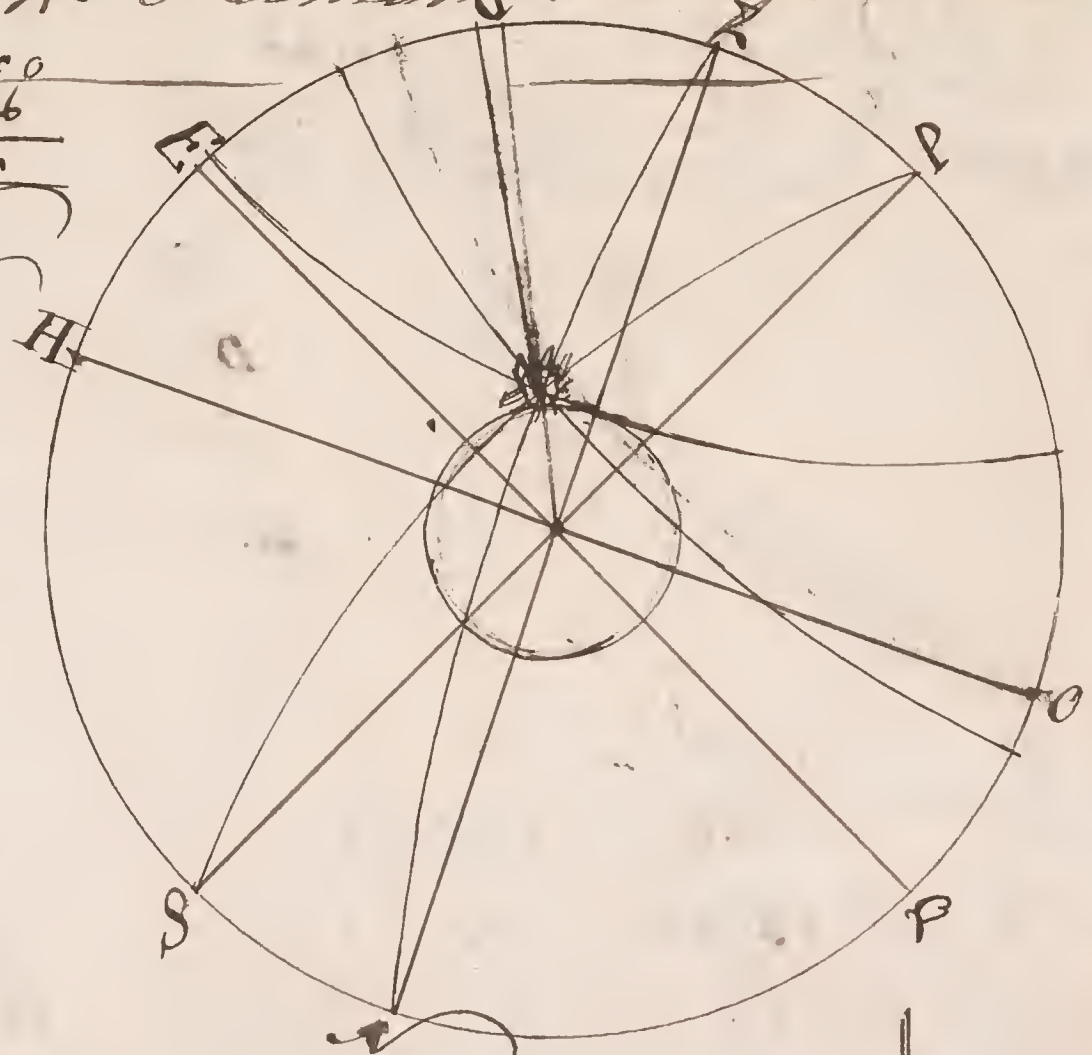
90 ... 00

1 — 15 — 1 ... 44

60 / 60 / 60

104
15
520

60 | 156 0 | 26
120 | 90
360 | 64
360



as Radius	90 ... 00		10.	
So Side P ☆	62 ... 20		9.944726	PD 50 ... 11
So is Angle P	64 ... 00		9.953660	DZ 39 ... 54
So Side D ☆	52 ... 45		9.900929	PZ 10 ... 17
				90 ... 00
as Sine ℓ P ☆	69 ... 55		9.563026	Lat 79 ... 43 N
So is Radius	90 ... 00		10	
So is Sine ℓ Angle P	64 ... 00		9.964142	
So Sine Side DP	50 ... 11		10.077681	
as Sine ℓ D ☆	52 ... 45		9.791.9166	
So is Radius	90 ... 00		10	
So is Sine ℓ Z ☆	62 ... 20		9.966242	
So Sine ℓ DZ	39 ... 54		9.657685	
as Side Zo	62 ... 20		9.944726	
So is Angle P	64 ... 00		9.953660	
So is Side Po	69 ... 55		9.972755	
So Sine angle Z	72 ... 23		19.926415	
			9.979146	

Azimuth is W S W ½ W

Prob. 20 To find the Beginning ~~and~~ End and
Duration of the Longest Day and the Longest Night
in any place with in the Polar Circles ——

At the North Cape I demand the Beginning End
& Duration of the longest Day & Longest Night